

**To:** Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]  
**Cc:** Barron, Alex[Barron.Alex@epa.gov]; McGartland, Al[McGartland.Al@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]  
**From:** Beauvais, Joel  
**Sent:** Wed 6/17/2015 2:25:19 AM  
**Subject:** Re: footnote for HD2

Thanks. We will have to not include this if SCC doesn't go this Friday. I believe Alex has flagged for OIRA so we'll just have to keep an eye on this for the next day or so until schedule resolves.

On Jun 16, 2015, at 3:39 PM, Kopits, Elizabeth <[Kopits.Elizabeth@epa.gov](mailto:Kopits.Elizabeth@epa.gov)> wrote:

Hi Joel,

# Ex. 5 - Deliberative

Thanks,

Elizabeth

**From:** Shouse, Kate

**Sent:** Tuesday, June 16, 2015 2:18 PM

**To:** Kopits, Elizabeth; Marten, Alex

**Subject:** footnote for HD2

Hi – I've created a file with the latest SCC section from the HD2 preamble and added two redline footnotes flagging the TSD correction. The first footnote is in the SC-CO2 section and the second is in the non-CO2 section. Please let me know what you think and I'll circle back with OTAQ to discuss logistics of working this into the final package.

Thanks,

Kate

<preamble SCC with June2015 footnote.docx>

**To:** Barron, Alex[Barron.Alex@epa.gov]; Shouse, Kate[Shouse.Kate@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]; McGartland, Al[McGartland.Al@epa.gov]  
**From:** Kopits, Elizabeth  
**Sent:** Fri 6/12/2015 6:51:36 PM  
**Subject:** Draft q&a and desk statement on use of Marten et al. in RIAs  
2015 06 12 Desk statement and Q&A on use of Marten et al. 2014 in RIAs.docx

Hi all-

Attached are some draft Q&A and a desk statement on valuing methane benefits in RIAs. Please let me know what you think or feel free to make edits directly and recirculate to all.

Al and I still haven't had a chance to connect regarding NAS next steps so I doubt I will be sending any names forward to Josh today. Let's all keep thinking about it though and we can try to get back to him on Monday.

Thanks!  
Elizabeth  
>  
>

**To:** Thundiyil, Karen[Thundiyil.Karen@epa.gov]  
**Cc:** Barron, Alex[Barron.Alex@epa.gov]; McGartland, Al[McGartland.Al@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]; Moore, Chris[Moore.Chris@epa.gov]  
**From:** Kopits, Elizabeth  
**Sent:** Mon 6/8/2015 9:00:16 PM  
**Subject:** Re: shorter benefits discussion for Landfill EG preamble

## Ex. 5 - Deliberative

The benefits discussion in the nsps is 2 pages. This is the eg preamble which I have now shortened to 9.

Sent from my iPhone

On Jun 8, 2015, at 4:42 PM, "Thundiyil, Karen" <Thundiyil.Karen@epa.gov> wrote:

Hi Elizabeth,

## Ex. 5 - Deliberative

Alex – can you clarify?

Karen.

**From:** Kopits, Elizabeth  
**Sent:** Monday, June 08, 2015 3:07 PM  
**To:** Thundiyil, Karen  
**Cc:** Barron, Alex; McGartland, Al; Marten, Alex; Moore, Chris  
**Subject:** shorter benefits discussion for Landfill EG preamble

Hi Karen,



Per the meeting with Joel last Friday, I have tried to shorten the benefits discussion in the Landfills EG preamble – see attached. It is now down to 9 pages or so. This also includes edits from Kate Shouse in OAP and Alex M. Not sure if the official word (both about this and that we are updating all numbers to reflect SCC correction) has made it to Peter and trickled down yet, but Kate thought it would be fine to go ahead and send to OAQPS. Do you want to do that, or would you like me to? Just let me know what you think is best.

Thanks!

Elizabeth

**To:** McGartland, Al[McGartland.Al@epa.gov]  
**Cc:** Thundiyil, Karen[Thundiyil.Karen@epa.gov]; Shouse, Kate[Shouse.Kate@epa.gov]; Barron, Alex[Barron.Alex@epa.gov]  
**From:** Kopits, Elizabeth  
**Sent:** Thur 6/4/2015 11:17:55 PM  
**Subject:** Re: Updated benefits language for Landfills NSPS

Thanks Al. Talking tomorrow would be good. OAQPS pushed back quite a bit that the 5 pager Kate and I put together earlier this week was too long. Not sure why. Hence we are now at a 2 pager.

I am off tomorrow but plan to call in to the 2:30 with Joel. Will ask robin if we can have a call-in since Chris was going to try to join in from San Diego too.

But happy to talk before then too. Feel free to call anytime.

Thanks,  
Elizabeth

Sent from my iPhone

On Jun 4, 2015, at 5:05 PM, "McGartland, Al" <McGartland.Al@epa.gov> wrote:

Thanks everyone. While I favor a substantive preamble discussion Alex and I both feel this minimum discussion is absolutely necessary Elizabeth we can talk tomorrow

Sent from my iPhone

On Jun 4, 2015, at 4:46 PM, Thundiyil, Karen <Thundiyil.Karen@epa.gov> wrote:

Thanks for looking at this, Elizabeth. I don't have any edits.

I'll send you the revised supplemental proposal once I have it.

Karen.

**From:** Kopits, Elizabeth  
**Sent:** Thursday, June 04, 2015 4:42 PM  
**To:** Thundiyil, Karen  
**Cc:** Shouse, Kate; Barron, Alex; McGartland, Al  
**Subject:** Re: Updated benefits language for Landfills NSPS

Karen T. and Kate,

# Ex. 5 - Deliberative

Finally, Karen, I would be interested in seeing the full supplemental proposal FRN once you get it - to see if they accepted my other few edits re: impacts and costs preceding the benefits discussion.

Thanks!

Elizabeth

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**From:** Marsh, Karen  
**Sent:** Thursday, June 4, 2015 3:00 PM  
**To:** Thundiyil, Karen  
**Cc:** Ward, Hillary; Fulcher, Charles; Shouse, Kate; Kopits, Elizabeth  
**Subject:** Updated benefits language for Landfills NSPS

Karen,

Attached is the updated version of the benefits language for the Landfills NSPS. This language will go immediately following Table 1 in the preamble. This is more in line with the amount of detail needed for the preamble. Please review this language and let me know if you have any additional comments or edits. Once we receive those edits we can finalize the package and have it sent back through the proper channels for submittal to OMB.

Thanks,

Karen

\*\*\*\*\*

Karen R. Marsh, PE

US EPA, OAQPS, Sectors Policies and Programs Division

Fuels and Incineration Group

109 TW Alexander Drive, Mail Code E143-05

Research Triangle Park, NC 27711

Direct: (919) 541-1065; email: [marsh.karen@epa.gov](mailto:marsh.karen@epa.gov)

**From:** Beauvais, Joel  
**Location:** DCRoomARN3530CFTB/DC-Ariel-Rios-AO  
**Importance:** Normal  
**Subject:** Social Cost of Carbon  
**Categories:** EZ Record - Shared  
**Start Date/Time:** Wed 4/15/2015 1:15:00 PM  
**End Date/Time:** Wed 4/15/2015 1:45:00 PM

**From:** McGartland, Al  
**Location:** 4424 wjc west  
**Importance:** Normal  
**Subject:** General SCC matters  
**Categories:** EZ Record - Shared  
**Start Date/Time:** Fri 4/10/2015 2:00:00 PM  
**End Date/Time:** Fri 4/10/2015 3:00:00 PM

**From:** Beauvais, Joel  
**Location:** DCRoomARN3500/OPEI  
**Importance:** Normal  
**Subject:** Social Cost of Carbon (SCC)  
**Start Date/Time:** Wed 2/11/2015 3:30:00 PM  
**End Date/Time:** Wed 2/11/2015 4:00:00 PM

Note: Tom is welcome to invite/bring his folks to participate

Ct: Robin Kime

**From:** Beauvais, Joel  
**Location:** Room: 3500 WJC North  
**Importance:** Normal  
**Subject:** SCC Check in  
**Categories:** EZ Record - Shared  
**Start Date/Time:** Tue 2/3/2015 3:30:00 PM  
**End Date/Time:** Tue 2/3/2015 4:00:00 PM



**To:** McGartland, Al[McGartland.Al@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]; Wolverton, Ann[Wolverton.Ann@epa.gov]; Newbold, Steve[Newbold.Steve@epa.gov]; Barron, Alex[Barron.Alex@epa.gov]; Shouse, Kate[Shouse.Kate@epa.gov]; Sarofim, Marcus[Sarofim.Marcus@epa.gov]  
**From:** Marten, Alex  
**Sent:** Wed 4/29/2015 10:21:36 PM  
**Subject:** social cost of atmospheric release  
[shindell - 2015 - the social cost of atmospheric release.pdf](#)

FYI... Drew Shindell's new paper on extending the SCC concept beyond just climate impacts and CO2.

--

Alex L. Marten  
phone: (202) 566-2301  
email: [marten.alex@epa.gov](mailto:marten.alex@epa.gov)

**To:** Beauvais, Joel[Beauvais.Joel@epa.gov]; Barron, Alex[Barron.Alex@epa.gov]  
**Cc:** Marten, Alex[Marten.Alex@epa.gov]  
**From:** McGartland, Al  
**Sent:** Fri 4/24/2015 6:14:18 PM  
**Subject:** Fwd: Schedule - time line  
[2015 04 23 draft SCC work timeline.docx](#)  
[ATT00001.htm](#)

Hi everyone. Alex was pulled this together quickly. I'm sending now in the interest of time. It may prove helpful. But we may continue to refine this.

Sent from my iPhone

Begin forwarded message:

**From:** "Marten, Alex" <[Marten.Alex@epa.gov](mailto:Marten.Alex@epa.gov)>  
**Date:** April 24, 2015 at 1:48:05 PM EDT  
**To:** "McGartland, Al" <[McGartland.Al@epa.gov](mailto:McGartland.Al@epa.gov)>  
**Subject:** RE: Schedule - time line

Attached is my best assessment. If there is anything I should add let me know.

Mary-Ellen has let Josh know that to maintain the preferred schedule things have to start now. It sounds like DOE is running into problems because the main contract officer for the NAS is gone for the year.

Hope the workshop is proving interesting.

--

Alex L. Marten  
phone: (202) 566-2301  
email: [marten.alex@epa.gov](mailto:marten.alex@epa.gov)

-----Original Message-----

From: McGartland, Al  
Sent: Friday, April 24, 2015 1:06 PM  
To: Marten, Alex  
Subject: Schedule - time line

I talked to Joel about stuff and he mentioned the time line. I know you are swamped. Can you find the time line Elizabeth did and update it? I told him we would have something early Monday. I can do this if you are too busy.

Sent from my iPhone

**To:** Wolverton, Ann[Wolverton.Ann@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov];  
Marten, Alex[Marten.Alex@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]; Shouse,  
Kate[Shouse.Kate@epa.gov]  
**Cc:** McGartland, Al[McGartland.Al@epa.gov]; Barron, Alex[Barron.Alex@epa.gov]  
**From:** Newbold, Steve  
**Sent:** Thur 4/23/2015 11:13:47 AM  
**Subject:** IAMs and peer review editorial and letters  
[Nature Climate Change Editorial 2015 IAMs helpful or not.pdf](#)  
[Rosen 2015 IAMs and peer review.pdf](#)  
[Smith et al 2015 Long history of IAM comparisons.pdf](#)

FYI:

From Nature Climate change, on IAMs and peer review

(On a first skim, I gather that the editorial and letter by Rosen are referring to IAMs that can be used to calculate the SCC—DICE, FUND, etc.—while the letter by Smith et al are referring to the broader class of IAMs that are often used for cost effectiveness analysis and regularly feature in the EMF exercises.)

\*\*\*\*\*

Steve Newbold  
U.S. EPA  
National Center for Environmental Economics (NCEE)  
EPA West, 4316T, MC 1809T  
1200 Pennsylvania Ave NW  
Washington, DC 20004  
(202) 566-2293

\*\*\*\*\*

**To:** McGartland, Al[McGartland.Al@epa.gov]; Barron, Alex[Barron.Alex@epa.gov]; Ferris, Ann[Ferris.Ann@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]; Jenkins, Robin[Jenkins.Robin@epa.gov]  
**Cc:** Wolverton, Ann[Wolverton.Ann@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; Newbold, Steve[Newbold.Steve@epa.gov]  
**From:** Shadbegian, Ron  
**Sent:** Wed 4/15/2015 5:50:38 PM  
**Subject:** Greenwire -- BLM crafting guidance on social cost of carbon -- internal memo

<http://www.eenews.net/greenwire/2015/04/15/stories/1060016810>

CLIMATE:

BLM crafting guidance on social cost of carbon -- internal memo

Phil Taylor, E&E reporter

Published: Wednesday, April 15, 2015

The Bureau of Land Management is developing comprehensive guidance on calculating the climate change impacts of mining oil, gas and coal from public lands, according to an internal memo obtained by Greenwire.

The memo, sent this month by Ed Roberson, BLM's assistant director of resources and planning, says the rapid warming of the planet is primarily caused by humans and that BLM should acknowledge this as it weighs the trade-offs of extracting more carbon-intensive minerals from the earth.

"Anthropogenic climate change is a reality," Roberson wrote in an email to BLM senior managers across the country. "Please ensure that all discussions of climate change in BLM's [National Environmental Policy Act] documents are consistent with this conclusion."

Roberson's name does not appear in the document, but the agency confirmed he was the author and that it was sent earlier this month.

The memo says BLM will be issuing "a comprehensive instruction memorandum" addressing climate change and the social cost of carbon in the next few months.

While the impact of that guidance remains unclear, environmentalists said Roberson's memo is a sign that the agency intends to take better stock of how its land management decisions affect the climate.

"This is the most authoritative statement from BLM on the reality of climate change," said Jeremy Nichols, who oversees climate and energy programs at WildEarth Guardians. "With the Obama administration putting its weight behind climate action, leasing more coal and oil and gas is definitely a liability."

A BLM official today said the memo is consistent with new draft guidance issued last December by the White House Council on Environmental Quality that addressed how federal agencies should consider greenhouse gas emissions and the impacts of climate change when conducting NEPA reviews (E&ENews PM, Dec. 18, 2014).

"That guidance emphasizes that agency analyses should be commensurate with projected greenhouse gas emissions and climate impacts and should employ appropriate qualitative and quantitative analytical methods to ensure useful information is available to the public and the decisionmaking process," the BLM official said.

The memo comes one month after an analysis by the liberal Center for American Progress found that the burning of oil, gas and coal from public lands and waters accounts for more than one-fifth of domestic greenhouse gas emissions (Greenwire, March 19). BLM manages roughly 250 million acres of public lands and is in charge of deciding which publicly owned minerals are leased to private industry and at what cost.

Roberson's memo may be a response to a decision last September by a federal district judge in Colorado that faulted BLM for failing to account for greenhouse gas emissions when it approved an Arch Coal Inc. mine expansion in a roadless area of the Gunnison National Forest (Greenwire, Sept. 17, 2014).

Environmentalists said that ruling will force BLM and the Forest Service to pay more attention to climate concerns when reviewing coal lease decisions under the National Environmental Policy Act.

Roberson's memo seems to acknowledge the need for a consistent approach to gauging mining's impacts on the climate.

In particular, it promises national guidance on how to use a controversial Obama administration tool known as the social cost of carbon (SCC).

The SCC, which the Obama administration first developed in 2010, seeks to estimate the incremental cost of releasing a ton of man-made carbon dioxide into the atmosphere when it comes to property damage, health care costs, lost agricultural output and other factors. The administration sparked a controversy in 2013 when it increased its SCC estimate to \$38 per metric ton, up from a 2010 estimate that would have set it at \$24.

While it is not a rule itself, the SCC has figured in numerous rulemakings, including U.S. EPA's Clean Power Plan for existing power plants. Opponents of SCC, namely congressional Republicans, have argued that the administration uses the figure to justify the cost of its rules and claim it is the product of a flawed and nontransparent process.

In the Colorado coal leasing case, Judge R. Brooke Jackson said regulators had to at least explain why they were opting against using the SCC calculation.

According to Roberson's memo, some BLM field offices have included estimates of the SCC in project-level NEPA documents.

"We are working on additional guidance for the field," he said.

But until then, if BLM field managers want to include the SCC in NEPA decisions, they are to contact BLM's headquarters in Washington, D.C., "for technical assistance," Roberson wrote.

Nichols, of WildEarth Guardians, said BLM field offices have inconsistently accounted for climate change in their land management decisions. For example, BLM's Idaho office included a SCC for oil and gas leasing, finding in its environment assessment that burning those minerals would result in \$3.7 million annually in carbon costs. But other BLM offices appear to be dismissing the impacts of greenhouse gas emissions from public lands, he said.

According to Roberson's memo, BLM in August 2014 sent an email to state directors with informal interim guidance on treatment of climate change and the social cost of carbon. That email has not been made public.

BLM in 2011 also circulated draft direction to the field on the use of quantitative greenhouse gas emissions and sequestration estimates and qualitative discussions of climate change impacts in NEPA documents. Roberson's memo indicates that that direction remains in effect.

Last month, former Interior Deputy Secretary David Hayes and former White House Council of Economic Advisers member James Stock penned an op-ed in The New York Times calling on the Obama administration to boost its scrutiny of federal coal leases, plus add the social cost of burning coal to the price of allowing mining companies to extract the fuel from public land.

**To:** Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; McGartland, Al[McGartland.Al@epa.gov];  
Barron, Alex[Barron.Alex@epa.gov]; Shouse, Kate[Shouse.Kate@epa.gov]  
**From:** Marten, Alex  
**Sent:** Tue 3/31/2015 10:49:36 PM  
**Subject:** FYI CBO WP on Truck/Rail External Costs using SCC

[http://www.cbo.gov/sites/default/files/cbofiles/attachments/50049-Freight\\_Transport\\_Working\\_Paper-2.pdf](http://www.cbo.gov/sites/default/files/cbofiles/attachments/50049-Freight_Transport_Working_Paper-2.pdf)

--

Alex L. Marten  
phone: (202) 566-2301  
email: [marten.alex@epa.gov](mailto:marten.alex@epa.gov)



**To:** Newbold, Steve[Newbold.Steve@epa.gov]; McGartland, Al[McGartland.Al@epa.gov]; Barron, Alex[Barron.Alex@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; Wolverton, Ann[Wolverton.Ann@epa.gov]  
**Cc:** Shouse, Kate[Shouse.Kate@epa.gov]  
**From:** Marten, Alex  
**Sent:** Tue 3/31/2015 8:08:11 PM  
**Subject:** FIY: Heritage SCC Presentation at DC Bar Brownbag  
[Handout - Slides Dayaratna.pdf](#)

Includes new arguments (e.g., slide 16).

--

Alex L. Marten  
phone: (202) 566-2301  
email: [marten.alex@epa.gov](mailto:marten.alex@epa.gov)

**To:** Barron, Alex[Barron.Alex@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]  
**From:** Evans, DavidA  
**Sent:** Wed 2/25/2015 9:17:38 PM  
**Subject:** RE: AEA papers  
[aer%2E104%2E5%2E544.pdf](#)  
[aer%2E104%2E5%2E547.pdf](#)

Other two papers are attached. Again, from the papers and proceedings.

**From:** Barron, Alex  
**Sent:** Wednesday, February 25, 2015 3:04 PM  
**To:** Marten, Alex; Evans, DavidA  
**Subject:** AEA papers

Not really your jobs, but I figure you may have a better sense of how to get access to these. The first one is the pressing question.

First does this paper have anything not in the discussion draft? Are the results the same?

Burtraw, Dallas, Josh Linn, Karen Palmer, and Anthony Paul. 2014. "The Costs and Consequences of Clean Air Act Regulation of CO2 from Power Plants." *American Economic Review*, 104(5): 557-62.

I am interested in a copy of this:

Sunstein, Cass R. 2014. "On Not Revisiting Official Discount Rates: Institutional Inertia and the Social Cost of Carbon." *American Economic Review*, 104(5): 547-51.

And this:

Weitzman, Martin L. 2014. "Fat Tails and the Social Cost of Carbon." *American Economic Review*, 104(5): 544-46.

And, if easy:

Leakage, Welfare, and Cost-Effectiveness of Carbon Policy (pp. 332-37) 103(3):

*Kathy Baylis, Don Fullerton and Daniel H. Karney*

Alex Barron, Ph.D.

Deputy Associate Administrator

Office of Policy

U.S. Environmental Protection Agency

202-564-3304

**To:** Barron, Alex[Barron.Alex@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]  
**From:** Evans, DavidA  
**Sent:** Wed 2/25/2015 8:12:55 PM  
**Subject:** RE: AEA papers

Alexes,

I'm on this.

d

**From:** Barron, Alex  
**Sent:** Wednesday, February 25, 2015 3:04 PM  
**To:** Marten, Alex; Evans, DavidA  
**Subject:** AEA papers

Not really your jobs, but I figure you may have a better sense of how to get access to these. The first one is the pressing question.

First does this paper have anything not in the discussion draft? Are the results the same?

Burtraw, Dallas, Josh Linn, Karen Palmer, and Anthony Paul. 2014. "The Costs and Consequences of Clean Air Act Regulation of CO2 from Power Plants." *American Economic Review*, 104(5): 557-62.

I am interested in a copy of this:

Sunstein, Cass R. 2014. "On Not Revisiting Official Discount Rates: Institutional Inertia and the Social Cost of Carbon." *American Economic Review*, 104(5): 547-51.

And this:

Weitzman, Martin L. 2014. "Fat Tails and the Social Cost of Carbon." *American Economic Review*, 104(5): 544-46.

And, if easy:

Leakage, Welfare, and Cost-Effectiveness of Carbon Policy (pp. 332-37) 103(3):

*Kathy Baylis, Don Fullerton and Daniel H. Karney*

Alex Barron, Ph.D.

Deputy Associate Administrator

Office of Policy

U.S. Environmental Protection Agency

202-564-3304

**From:** Poole, Jacqueline  
**Location:** Room: 3500 WJC North  
**Importance:** Normal  
**Subject:** SCC Check in  
**Categories:** Record Saved - Shared  
**Start Date/Time:** Tue 2/3/2015 3:30:00 PM  
**End Date/Time:** Tue 2/3/2015 4:00:00 PM

**To:** Barron, Alex[Barron.Alex@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]; Newbold, Steve[Newbold.Steve@epa.gov]; Wolverton, Ann[Wolverton.Ann@epa.gov]  
**From:** Marten, Alex  
**Sent:** Thur 1/29/2015 4:46:33 PM  
**Subject:** RE: JBCA papers  
[sussman et al - 2014 - challenges in applying the paradigm of welfare economics to climate change.pdf](#)  
[weyant - 2014 - integrated assessment of climate change state of the literature.pdf](#)

FYI... Jai Li in OAP was involved in the development of this special issue.

--

Alex L. Marten  
phone: (202) 566-2301  
email: [marten.alex@epa.gov](mailto:marten.alex@epa.gov)

**From:** Barron, Alex  
**Sent:** Thursday, January 29, 2015 11:39 AM  
**To:** Griffiths, Charles; Newbold, Steve; Marten, Alex; Wolverton, Ann  
**Subject:** JBCA papers

Does anyone have pdf's of these two papers?

<http://www.degruyter.com/view/j/jbca.2014.5.issue-3/jbca-2014-9001/jbca-2014-9001.xml?format=INT>

<http://www.degruyter.com/view/j/jbca.2014.5.issue-3/jbca-2014-9002/jbca-2014-9002.xml?format=INT>

Alex Barron, Ph.D.

Deputy Associate Administrator

Office of Policy

U.S. Environmental Protection Agency

202-564-3304



**To:** Beauvais, Joel[Beauvais.Joel@epa.gov]; Barron, Alex[Barron.Alex@epa.gov]; McGartland, Al[McGartland.Al@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]  
**From:** Kopits, Elizabeth  
**Sent:** Tue 1/13/2015 6:13:15 PM  
**Subject:** RE: SCC article

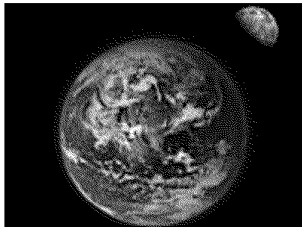
Yes, got it yesterday, thanks!

**From:** Beauvais, Joel  
**Sent:** Tuesday, January 13, 2015 12:28 PM  
**To:** Barron, Alex; McGartland, Al; Kopits, Elizabeth; Marten, Alex  
**Subject:** SCC article

Thought you might find this of interest if you hadn't already seen it

#### Climate Change

New Study Finds Social Cost of Carbon  
Could Be Six Times Higher Than Estimated



By [Andrea Vittorio](#)

Jan. 12 — The economic damage caused by a ton of carbon dioxide emissions could be six times higher than the federal government's current estimate, according to a [new study](#) from two Stanford University scientists.

The scientists estimated that the social cost of carbon, as it is called, totals \$220 per metric ton, much higher than the figure of \$37 per metric ton that federal agencies use to calculate the impact of climate change in their regulations ([214 DEN A-1, 11/5/13](#)).

Study co-author Delavane Diaz said their findings, published online Jan. 12 in the journal *Nature Climate Change*, suggest that more stringent mitigation policies, even expensive ones, may be warranted.

"If the social cost of carbon is higher, many more mitigation measures will pass a cost-benefit analysis," she said. "Because carbon emissions are so harmful to society, even costly means of reducing emissions would be worthwhile."

Damages Over Time

The federal government's \$37 per metric ton figure, which was recently updated, is based on a model that the Stanford scientists say fails to account for how the damages associated with climate change might persist over time. In their study, they changed the model so that it could incorporate recent empirical findings suggesting that climate change could substantially slow economic growth rates, particularly in poor countries.

“For 20 years now, the models have assumed that climate change can't affect the basic growth-rate of the economy,” study co-author Frances Moore said in a statement. “But a number of new studies suggest this may not be true. If climate change affects not only a country's economic output, but also its growth, then that has a permanent effect that accumulates over time, leading to a much higher social cost of carbon.”

Moore and Diaz also modified the model to account for adaptation to climate change and they divided the model into two regions to represent high-and low-income countries. They noted, however, that the model did not factor in the potential for mitigation efforts to also affect growth, nor did it take into account the fact that low-carbon technologies take time to develop and deploy.

To contact the reporter on this story: Andrea Vittorio in Washington at [avittorio@bna.com](mailto:avittorio@bna.com)

To contact the editor responsible for this story: Larry Pearl at [lpearl@bna.com](mailto:lpearl@bna.com)

#### For More Information

The Stanford scientists' study, “Temperature impacts on economic growth warrant stringent mitigation policy,” is available at <http://www.nature.com/nclimate/journal/vaop/ncurrent/full/nclimate2481.html>



# The Social Cost of Carbon

KEVIN D. DAYARATNA, PH.D.

Senior Statistician and Research  
Programmer  
The Heritage Foundation  
Washington DC

Nothing written here is to be construed as necessarily reflecting the views of The Heritage Foundation or as an attempt to aid or hinder the passage of any bill before Congress.

## Important questions to ask

- So how does the government estimate the SCC?
- Is it even reliable as a tool for energy policy rulemaking?





# What is the Social Cost of Carbon?

- Defined by the EPA as “the economic damages per metric ton of carbon dioxide emissions”

heritage.org

March 30, 2015

3



## So how does one actually estimate the SCC?

- General question – What is the long term economic impact of carbon dioxide emissions summed over a particular time horizon?
- Three statistical models
  - DICE model
  - FUND model
  - PAGE model

heritage.org

March 30, 2015

4



## As with any statistical model ...

- These models are grounded by assumptions
  - Discount rate
  - Time horizon
  - Equilibrium climate sensitivity
- We ran two of the three models, rigorously examining the following assumptions ...

heritage.org March 30, 2015

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## Assumption 1 - Discount rate

- We talked about summing up damages
- Not all damages are created equal
- How do we quantify this inequality?
  - EPA used 2.5%, 3%, and 5% discount rates
  - Office of Management and Budget (OMB) suggested a 7% discount rate be used

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## Assumption 2 - Time horizon

- Projected economic damages are summed
- Question – For how long?

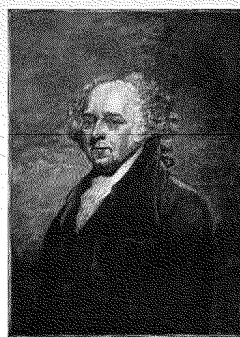
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## How far into the future can we see?



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## Assumption 3 - Equilibrium Climate Sensitivity

- Is the science truly settled on global warming?
  - If it's science, then how can it be settled?
- ECS Distributions
  - Roe Baker (2007)
  - Otto et al (2013)
  - Lewis (2013)

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## Comparison of ECS distributions

Probability of temperature (in degrees C) exceeding...	Outdated Roe Baker (2007) distribution	Otto et al (2013) distribution	Lewis (2013) distribution
1.5	0.983	0.773	0.542
2.5	0.664	0.226	0.008
3.5	0.366	0.066	0.001
4.5	0.199	0.023	< 0.001
5.5	0.118	0.012	< 0.001
6.5	0.070	0.008	< 0.001

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## Now what happens if we tweak these assumptions?

In particular, tweaking the discount rate, time horizon, and ECS distributions ...



## DICE model – Changes to Discount Rate

TABLE 1

Average SCC Baseline, End Year 2300

Year	Discount Rate: 2.5%	Discount Rate: 3%	Discount Rate: 5%	Discount Rate: 7%
2010	\$46.57	\$30.04	\$8.81	\$4.02
2015	\$52.35	\$34.32	\$10.61	\$5.03
2020	\$56.92	\$37.79	\$12.10	\$5.87
2025	\$61.48	\$41.26	\$13.60	\$6.70
2030	\$66.52	\$45.14	\$15.33	\$7.70
2035	\$71.57	\$49.03	\$17.06	\$8.70
2040	\$76.95	\$53.25	\$19.02	\$9.85
2045	\$82.34	\$57.48	\$20.97	\$11.00
2050	\$87.69	\$61.72	\$23.06	\$12.25

Source: Calculations based on Heritage Foundation Monte Carlo simulation results using the DICE model.

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# DICE model – Changes to End Year

TABLE 3

## Average SCC, End Year 2150

Year	Discount Rate: 2.5%	Discount Rate: 3%	Discount Rate: 5%	Discount Rate: 7%
2010	\$36.78	\$26.01	\$8.66	\$4.01
2015	\$41.24	\$29.65	\$10.42	\$5.02
2020	\$44.41	\$32.38	\$11.85	\$5.85
2025	\$47.57	\$35.11	\$13.28	\$6.68
2030	\$50.82	\$38.00	\$14.92	\$7.67
2035	\$54.07	\$40.89	\$16.56	\$8.66
2040	\$57.17	\$43.79	\$18.36	\$9.79
2045	\$60.27	\$46.68	\$20.16	\$10.92
2050	\$62.81	\$49.20	\$22.00	\$12.13

Source: Calculations based on Heritage Foundation Monte Carlo simulation results using the DICE model.

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# DICE model – Changes to ECS Distribution

TABLE 7

## Average SCC-ECS Distribution Updated in Accordance with Otto et al. (2013), End Year 2300

Year	Discount Rate: 2.5%	Discount Rate: 3%	Discount Rate: 5%	Discount Rate: 7%
2010	\$26.64	\$17.72	\$5.73	\$2.80
2015	\$29.96	\$20.24	\$6.87	\$3.48
2020	\$32.65	\$22.32	\$7.82	\$4.04
2025	\$35.35	\$24.41	\$8.78	\$4.59
2030	\$38.33	\$26.74	\$9.88	\$5.26
2035	\$41.31	\$29.08	\$10.99	\$5.93
2040	\$44.54	\$31.63	\$12.24	\$6.69
2045	\$47.77	\$34.18	\$13.48	\$7.45
2050	\$51.19	\$36.91	\$14.84	\$8.29

Source: Calculations based on Heritage Foundation Monte Carlo simulation results using the DICE model.

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## Do these models suggest that global warming is good thing or a bad thing?

Do they suggest that there are economic damages associated with carbon dioxide emissions?

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## FUND model Monte Carlo simulation results, probability of negative SCC

TABLE 11

**Probability of Negative SCC  
Averaged Across All Five Scenarios  
Using Outdated Roe Baker (2007)  
Distribution**

Year	DISCOUNT RATE			
	2.5%	3%	5%	7%
2010	0.087	0.121	0.372	0.642
2020	0.084	0.115	0.344	0.601
2030	0.080	0.108	0.312	0.555
2040	0.075	0.101	0.282	0.507
2050	0.071	0.093	0.251	0.455

**Source:** Calculations based on Heritage Foundation Monte Carlo simulation results using the FUND model.

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TABLE 12

**Probability of Negative SCC  
Averaged Across All Five Scenarios  
Using Otto et al. (2013) Distribution**

Year	DISCOUNT RATE			
	2.5%	3%	5%	7%
2010	0.278	0.321	0.529	0.701
2020	0.268	0.306	0.496	0.661
2030	0.255	0.291	0.461	0.619
2040	0.244	0.274	0.425	0.571
2050	0.228	0.256	0.386	0.517

**Source:** Calculations based on Heritage Foundation Monte Carlo simulation results using the FUND model.

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## The IWG primarily just reports point estimates

What if we want to think about the overall distributional properties of the SCC?

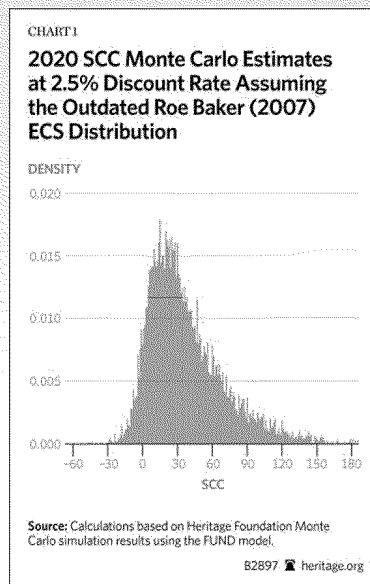
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The big picture for the FUND model assuming 2.5% discount rate and the outdated Roe Baker ECS distribution

What do the overall distributions look like?



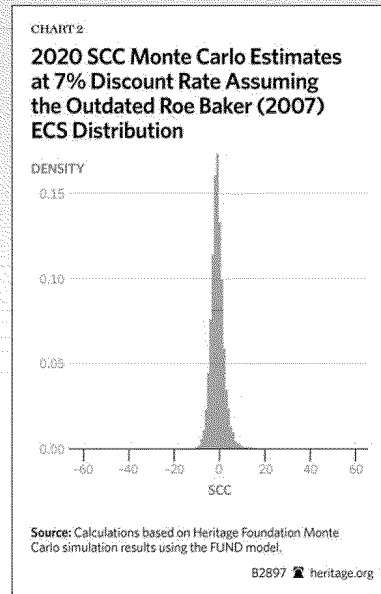
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The big picture for the  
FUND model assuming  
7% discount rate and  
the outdated Roe Baker  
ECS distribution

What do the overall  
distributions look like?



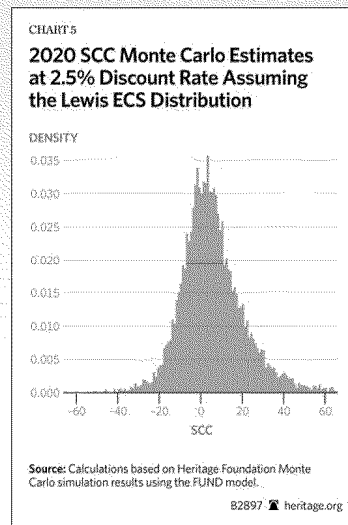
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The big picture for the  
FUND model assuming  
a 2.5% discount rate  
and the Lewis 2013  
ECS distribution

What do the overall  
distributions look like?



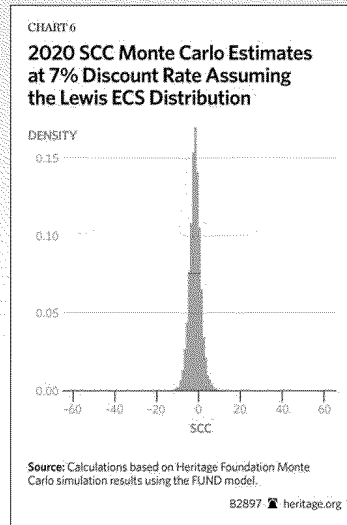
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The big picture for the  
FUND model assuming  
a 7% discount rate and  
the Lewis 2013  
distribution

What do the overall  
distributions look like?



So what if we actually wanted to  
take these models seriously?

Supposing they have legitimacy (which they don't) ...



## So what if we actually want to take these models seriously?

- If you do take them seriously, and institute the proposed regulations, we found that using the Heritage Energy Model that by 2030:
  - Average employment shortfall of 300,000 lost jobs
  - A peak employment shortfall of over 1 million jobs
  - 500,000 lost manufacturing jobs

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## So what if we actually wanted to take these models seriously?

- Model's can't be trusted. If you do trust them and implement the associated regulations, then the result would be literally an economic disaster.

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## Is there any reason to believe these models?

- Extremely Sensitive to Slight tweaks to assumptions
- With the results all across the map, it's difficult to take these results seriously
- Damage functions are arbitrary



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## Thank you!

Any questions?



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**To:** Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]  
**Cc:** Beauvais, Joel[Beauvais.Joel@epa.gov]; McGartland, Al[McGartland.Al@epa.gov]  
**From:** Barron, Alex  
**Sent:** Wed 6/17/2015 7:45:27 PM  
**Subject:** Re: timing heads up

Will call again as soon as I am out of this meeting.

Sent from my iPhone

On Jun 17, 2015, at 3:35 PM, Kopits, Elizabeth <[Kopits.Elizabeth@epa.gov](mailto:Kopits.Elizabeth@epa.gov)> wrote:

Alex – any word back from OIRA yet? Kate just called to mention again that the window for adding the footnote may be closing today.

**From:** Shouse, Kate  
**Sent:** Wednesday, June 17, 2015 12:36 PM  
**To:** Barron, Alex  
**Cc:** Kopits, Elizabeth  
**Subject:** timing heads up

Thanks, Alex. FYI, OTAQ is in the process of submitting the HD2 package to OMB via ROCIS. Sounds like they are going to hit send today so the window to add the footnote may be closing.

**From:** Barron, Alex  
**Sent:** Wednesday, June 17, 2015 11:23 AM  
**To:** Kopits, Elizabeth; Shouse, Kate; Marten, Alex  
**Cc:** McGartland, Al; Fawcett, Allen  
**Subject:** SCC Draft Blog 6-16-15\_ek ab.docx

A few minor edits (including adding some clarification into existing bubbles). If this looks okay to everyone, I would send back our feedback as Joel is out of pocket for the morning. Also feel free to call if there are questions.



Still waiting for details on timing.

Alex

**To:** Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; Al McGartland[McGartland.Al@epa.gov]; Marten, Alex (Marten.Alex@epa.gov)[Marten.Alex@epa.gov]  
**Cc:** Joel Beauvais[Beauvais.Joel@epa.gov]; Gunning, Paul[Gunning.Paul@epa.gov]; Allen Fawcett[Fawcett.Allen@epa.gov]  
**From:** Barron, Alex  
**Sent:** Fri 5/22/2015 8:40:15 PM  
**Subject:** E&E Senators warn DOE on 'social cost of carbon'

<http://www.eenews.net/eenewspm/2015/05/22/stories/1060019079>

## Senators warn DOE on 'social cost of carbon'

Geof Koss, Hannah Northey, Manuel Quiñones and Annie Snider, E&E reporters

Published: Friday, May 22, 2015

Senate appropriators are looking to put the brakes on the Department of Energy's use of a controversial metric for estimating the benefits of cutting carbon dioxide emissions.

The [report](#) accompanying the fiscal 2016 energy-water spending bill passed by the Senate Appropriations Committee yesterday instructs DOE not to "promulgate any regulations in fiscal year 2016 using the May 2013 estimates for the social cost of carbon until a new working group is convened."

The report also details appropriators' intentions on a wide array of other issues, including electric reliability, nuclear regulation, fossil fuel research and drought.

Critics have accused the Obama administration of flouting transparency in developing the complex social cost of carbon (SCC) formula, which estimates the per-ton costs of releasing man-made carbon dioxide into the atmosphere. U.S. EPA and DOE both use the formula to justify the economic benefits of regulations, and the Bureau of Land Management is currently drafting guidance on calculating the SCC of extracting fossil fuels from public lands ([Greenwire](#), April 15).

An outcry from Republicans over a 2013 SCC revision that hiked the cost of CO<sub>2</sub> to \$38 a metric ton for 2015 -- up from \$24 a ton in the 2010 estimate -- prompted the administration to solicit comments on the revisions, but agencies have shown no sign of backing down on its use.

The Senate appropriators' instructions mirror language contained in the House report accompanying its energy-water spending bill ([H.R. 2028](#)), which passed last month.

Both provisions would direct the new working group to "include the relevant agencies and affected stakeholders, re-examine the social cost of carbon using the best available science, and revise the estimate using an accurate discount rate and domestic estimate in accordance with Executive Order 12866 and OMB Circular A-4." The instructions also call for another round of public comments before finalizing any updates.

Republicans have targeted the SCC previously, but will have more leverage now that they control the

Senate. At least one House bill ([H.R. 340](#)) would bar agencies from using the SCC.

## **Cuts for reliability**

The Senate bill would make a deep cut in funding for electric reliability, providing the Energy Department about \$152 million to shore up new grid technology aimed at delivery and reliability, a decrease of almost \$118 million from President Obama's spending request.

...

Alex Barron, Ph.D.

Deputy Associate Administrator

Office of Policy

U.S. Environmental Protection Agency

202-564-3304

**To:** Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; Shouse, Kate[Shouse.Kate@epa.gov]; Marten, Alex (Marten.Alex@epa.gov)[Marten.Alex@epa.gov]  
**Cc:** Al McGartland[McGartland.Al@epa.gov]; Joel Beauvais[Beauvais.Joel@epa.gov]  
**From:** Barron, Alex  
**Sent:** Fri 5/15/2015 10:44:30 PM  
**Subject:** QA OMB RTC Draft v1\_ab.docx  
[QA OMB RTC Draft v1\\_ab.docx](#)

I only managed one pass through the document, but take a look at these and let me know what you think.

Alex

**To:** Shouse, Kate[Shouse.Kate@epa.gov]; Gunning, Paul[Gunning.Paul@epa.gov]; Fawcett, Allen[Fawcett.Allen@epa.gov]  
**Cc:** Marten, Alex[Marten.Alex@epa.gov]; McGartland, Al[McGartland.Al@epa.gov]; Silverman, Steven[silverman.steven@epa.gov]; Kulschinsky, Edward[Kulschinsky.Edward@epa.gov]  
**From:** Barron, Alex  
**Sent:** Wed 4/29/2015 11:57:28 PM  
**Subject:** Scc rtc

Paul and Kate and Allen - do you have a set of the most recent rtc's we did on scc issues in a final rule? It might be handy to share with some lawyers at doe.

Thanks,  
a

Sent from my iPhone

**To:** Al McGartland[McGartland.Al@epa.gov]; Marten, Alex  
(Marten.Alex@epa.gov)[Marten.Alex@epa.gov]; Allen Fawcett[Fawcett.Allen@epa.gov]  
**From:** Barron, Alex  
**Sent:** Fri 4/17/2015 8:21:11 PM  
**Subject:** FW: SCC Technical Discussion

-----Original Appointment-----

**From:** Barron, Alex  
**Sent:** Friday, April 17, 2015 1:24 PM  
**To:** Laity, Jim  
**Subject:** Accepted: SCC Technical Discussion  
**When:** Monday, April 20, 2015 2:30 PM-3:00 PM (UTC-05:00) Eastern Time (US & Canada).  
**Where:** Call-in Number TBD

**To:** Beauvais, Joel[Beauvais.Joel@epa.gov]; McGartland, Al[McGartland.Al@epa.gov]; Fawcett, Allen[Fawcett.Allen@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]; Shouse, Kate[Shouse.Kate@epa.gov]; Gunning, Paul[Gunning.Paul@epa.gov]  
**From:** Barron, Alex  
**Sent:** Wed 4/15/2015 5:15:04 PM  
**Subject:** CLIMATE: BLM crafting guidance on social cost of carbon -- internal memo -- Wednesday, April 15, 2015 -- www.eenews.net

<http://www.eenews.net/greenwire/2015/04/15/stories/1060016810>

Sent from my iPhone

**To:** Marten, Alex[Marten.Alex@epa.gov]  
**Cc:** McGartland, Al[McGartland.Al@epa.gov]  
**From:** Barron, Alex  
**Sent:** Thur 3/12/2015 10:04:03 PM  
**Subject:** Re: any interest in co-locating for tomorrow's scc call?

I am happy to offer my office or come to you.

Sent from my iPhone

On Mar 12, 2015, at 5:26 PM, Marten, Alex <[Marten.Alex@epa.gov](mailto:Marten.Alex@epa.gov)> wrote:

--

Alex L. Marten  
phone: (202) 566-2301  
email: [marten.alex@epa.gov](mailto:marten.alex@epa.gov)



**To:** Marten, Alex (Marten.Alex@epa.gov)[Marten.Alex@epa.gov]; DavidA  
Evans[Evans.DavidA@epa.gov]  
**From:** Barron, Alex  
**Sent:** Wed 2/25/2015 8:04:28 PM  
**Subject:** AEA papers

Not really your jobs, but I figure you may have a better sense of how to get access to these. The first one is the pressing question.

First does this paper have anything not in the discussion draft? Are the results the same?

Burtraw, Dallas, Josh Linn, Karen Palmer, and Anthony Paul. 2014. "The Costs and Consequences of Clean Air Act Regulation of CO2 from Power Plants." *American Economic Review*, 104(5): 557-62.

I am interested in a copy of this:

Sunstein, Cass R. 2014. "On Not Revisiting Official Discount Rates: Institutional Inertia and the Social Cost of Carbon." *American Economic Review*, 104(5): 547-51.

And this:

Weitzman, Martin L. 2014. "Fat Tails and the Social Cost of Carbon." *American Economic Review*, 104(5): 544-46.

And, if easy:

Leakage, Welfare, and Cost-Effectiveness of Carbon Policy (pp. 332-37) 103(3):

*Kathy Baylis, Don Fullerton and Daniel H. Karney*

Alex Barron, Ph.D.

Deputy Associate Administrator

Office of Policy

U.S. Environmental Protection Agency

202-564-3304

**To:** Marten, Alex (Marten.Alex@epa.gov)[Marten.Alex@epa.gov]  
**From:** Barron, Alex  
**Sent:** Mon 2/9/2015 7:21:20 PM  
**Subject:** 2015 02 09 SCC NAS comms materials ab.docx  
[2015 02 09 SCC NAS comms materials ab.docx](#)

Sorry for the second bite at the apple. Just a little slimming and edits to anticipate what OMB will be looking for. If these work, we should get it over to OMB.

Also, let me know if I should copy Kate on these things...

Alex

**To:** Marten, Alex (Marten.Alex@epa.gov)[Marten.Alex@epa.gov]  
**Cc:** Al McGartland[McGartland.Al@epa.gov]  
**From:** Barron, Alex  
**Sent:** Mon 2/9/2015 3:40:02 PM  
**Subject:** 2015 02 09 NAS SCC draft charge questions.docx

Here it is with the new question they wanted swapped in.

[https://usepa-my.sharepoint.com/personal/barron\\_alex\\_epa\\_gov/Documents/SCC/2015%2002%2009%20NAS%20SCC%20draft%20charge%20questions.docx?web=1](https://usepa-my.sharepoint.com/personal/barron_alex_epa_gov/Documents/SCC/2015%2002%2009%20NAS%20SCC%20draft%20charge%20questions.docx?web=1)

**To:** Marten, Alex (Marten.Alex@epa.gov)[Marten.Alex@epa.gov]  
**From:** Barron, Alex  
**Sent:** Tue 2/3/2015 8:29:27 PM  
**Subject:** 2015 02 02 SCC Overview - alm.docx  
2015 02 02 SCC Overview - alm.docx

Two items.

**To:** Marten, Alex[Marten.Alex@epa.gov]; Shouse, Kate[Shouse.Kate@epa.gov]  
**Cc:** McGartland, Al[McGartland.Al@epa.gov]; Fawcett, Allen[Fawcett.Allen@epa.gov]  
**From:** Barron, Alex  
**Sent:** Tue 2/3/2015 5:47:29 PM  
**Subject:** RE: 2015 02 02 SCC RTC intro draft.docx

Oar –

Do you have feedback?

**From:** Marten, Alex  
**Sent:** Tuesday, February 03, 2015 12:38 PM  
**To:** Barron, Alex; Shouse, Kate  
**Cc:** McGartland, Al; Fawcett, Allen  
**Subject:** RE: 2015 02 02 SCC RTC intro draft.docx

This looks good to me. A few suggested edits on the last paragraph, but not wedded to them.

The “supplementary information” section is the request for comment text verbatim, so I’m not sure we can retroactively edit that.

--

Alex L. Marten  
phone: (202) 566-2301  
email: marten.alex@epa.gov

**From:** Barron, Alex  
**Sent:** Tuesday, February 03, 2015 12:18 PM  
**To:** Marten, Alex; Shouse, Kate  
**Cc:** McGartland, Al; Fawcett, Allen  
**Subject:** 2015 02 02 SCC RTC intro draft.docx

Not sure we will want the last para I added, but probably worth offering to OMB at the staff level. Give me a call if you have questions.

**To:** Beauvais, Joel[Beauvais.Joel@epa.gov]  
**Cc:** Rennert, Kevin[Rennert.Kevin@epa.gov]; McGartland, Al[McGartland.Al@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]; Roberts, Martha[Roberts.Martha@epa.gov]  
**From:** Kopits, Elizabeth  
**Sent:** Tue 7/21/2015 9:46:27 PM  
**Subject:** Re: 7.21.2015\_JMI et al to EPA re SCC docs.pdf

Thanks Joel. Our next SCC meeting with you is currently scheduled for next Tuesday (7/28) am. But please let me know if you would like to talk before then too.

Elizabeth

Sent from my iPhone

> On Jul 21, 2015, at 5:30 PM, "Beauvais, Joel" <Beauvais.Joel@epa.gov> wrote:  
>  
> FYI - we can discuss further when appropriate  
>  
> <7.21.2015\_JMI et al to EPA re SCC docs.pdf>  
>  
>  
>  
>



**From:** Kopits, Elizabeth  
**Location:** DCRoomARN3500/OPEI  
**Importance:** Normal  
**Subject:** Accepted: SCC Draft Charge  
**Start Date/Time:** Tue 1/6/2015 6:00:00 PM  
**End Date/Time:** Tue 1/6/2015 6:30:00 PM

**From:** Beauvais, Joel  
**Location:** DCRoomARN3530CFTB/DC-Ariel-Rios-AO  
**Importance:** Normal  
**Subject:** Social Cost of Carbon  
**Start Date/Time:** Wed 4/15/2015 1:15:00 PM  
**End Date/Time:** Wed 4/15/2015 1:45:00 PM

**To:** Griffiths, Charles[Griffiths.Charles@epa.gov]; Newbold, Steve[Newbold.Steve@epa.gov]; Wolverton, Ann[Wolverton.Ann@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]  
**From:** Marten, Alex  
**Sent:** Wed 4/15/2015 5:21:25 PM  
**Subject:** FW: CLIMATE: BLM crafting guidance on social cost of carbon -- internal memo -- Wednesday, April 15, 2015 -- www.eenews.net

--

Alex L. Marten  
phone: (202) 566-2301  
email: marten.alex@epa.gov

-----Original Message-----

From: Barron, Alex  
Sent: Wednesday, April 15, 2015 1:15 PM  
To: Beauvais, Joel; McGartland, Al; Fawcett, Allen; Marten, Alex; Shouse, Kate; Gunning, Paul  
Subject: CLIMATE: BLM crafting guidance on social cost of carbon -- internal memo -- Wednesday, April 15, 2015 -- www.eenews.net

<http://www.eenews.net/greenwire/2015/04/15/stories/1060016810>

Sent from my iPhone

**To:** Newbold, Steve[Newbold.Steve@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]; Wolverton, Ann[Wolverton.Ann@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]  
**From:** McGartland, Al  
**Sent:** Mon 4/13/2015 9:15:30 AM  
**Subject:** Fwd: Pricing Climate Risk Mitigation  
[Pizer et al Science 2014.pdf](#)  
[ATT00001.htm](#)  
[Aldy Nature Climate Change 2015.pdf](#)  
[ATT00002.htm](#)

Sorry for any duplication.

Sent from my iPhone

Begin forwarded message:

**From:** "Aldy, Joseph" <Joseph\_Aldy@hks.harvard.edu>  
**To:** "McGartland, Al" <McGartland.Al@epa.gov>  
**Subject:** Pricing Climate Risk Mitigation

Al,

I hope you are well. I have recently published a commentary in Nature Climate Change titled "Pricing Climate Risk Mitigation" (see attached). In this commentary, I discuss why adaptation and geoengineering should be considered in the estimation of the social cost of carbon. In particular, I suggest that "adaptation response functions" and "geoengineering response functions" should be incorporated in integrated assessment models focused on generating social cost of carbon estimates. I also describe a research agenda that could inform such an effort. I would welcome any thoughts you may have on this. In the commentary, I also cite the recent Science policy forum article that I co-authored with Billy Pizer and others, which I have attached for your reference.

Best,

Joe

Joseph E. Aldy  
Assistant Professor of Public Policy  
Harvard Kennedy School  
Taubman 382, Mailbox 57  
79 JFK Street  
Cambridge, MA 02138  
V: 617-496-7213  
E: [joseph\\_aldy@hks.harvard.edu](mailto:joseph_aldy@hks.harvard.edu)<[mailto:joseph\\_aldy@hks.harvard.edu](mailto:joseph_aldy@hks.harvard.edu)>

I: [www.hks.harvard.edu/fs/jaldy/](http://www.hks.harvard.edu/fs/jaldy/)<<http://www.hks.harvard.edu/fs/jaldy/>>

Faculty Chair, Regulatory Policy Program  
Mossavar-Rahmani Center for Business and Government

I: [www.hks.harvard.edu/centers/mrcbg/programs/rpp](http://www.hks.harvard.edu/centers/mrcbg/programs/rpp)

Visiting Fellow

Resources for the Future

I: <http://www.rff.org/aldy.cfm>

Faculty Research Fellow

National Bureau of Economic Research

I: [http://www.nber.org/people/joseph\\_aldy](http://www.nber.org/people/joseph_aldy)

Senior Adviser

Center for Strategic and International Studies

I: [csis.org/expert/joseph-aldy](http://csis.org/expert/joseph-aldy)<<http://csis.org/expert/joseph-aldy>>

**To:** Griffiths, Charles[Griffiths.Charles@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]; Newbold, Steve[Newbold.Steve@epa.gov]; Wolverton, Ann[Wolverton.Ann@epa.gov]  
**From:** Heninger, Brian  
**Sent:** Tue 1/13/2015 3:45:40 PM  
**Subject:** Researchers say the social cost of carbon will be 6 times the Obama administration's estimate

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<http://www.eenews.net/climatewire/2015/01/13/stories/1060011557>

## **Researchers say the social cost of carbon will be 6 times the Obama administration's estimate**

Evan Lehmann, E&E reporter

Published: Tuesday, January 13, 2015

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The paper, published yesterday in the journal *Nature Climate Change*, adds to a growing number of voices calling for improvements to the complicated process of establishing the cost estimate, which is used to measure the benefits of regulations. A dozen federal agencies set the price using three computer models that project emission rates, economic activity and climate damages.

The Stanford paper bases its findings on prior research showing that the economic health of a country suffers during periods of high temperatures. Heat can harm agricultural and industrial output, while increasing political instability. In that way, the Stanford analysis subscribes to emerging calls among experts to incorporate new observations into the trio of models that date back to the 1990s.

"The social cost of carbon is almost certainly larger of what's being used so far," said co-author Frances Moore, a doctoral candidate at Stanford's School of Earth Sciences.

In a key departure from the government's analysis, the **paper** uses the previous empirical research to assert that climate impacts could damage a nation's economic growth rate over time, rather than just harassing its year-to-year economic output.

That could mean that nations face permanent malfunctions, like economic declines in labor, capital and technology

**To:** Griffiths, Charles[Griffiths.Charles@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]; Newbold, Steve[Newbold.Steve@epa.gov]; Wolverton, Ann[Wolverton.Ann@epa.gov]  
**From:** Heninger, Brian  
**Sent:** Tue 1/13/2015 3:45:40 PM  
**Subject:** Researchers say the social cost of carbon will be 6 times the Obama administration's estimate

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from severe weather and other "temperature shocks." The authors say these bigger impacts have a "compounding effect" that is more damaging to the economy than temporary strains from heat on agricultural output and more expensive air conditioning costs.

"So the economy is kind of permanently lower," Moore said. "If you have repeated shocks, in that case, they accumulate over time. That's why even very, very small reductions in growth rates have these really big effects over time."

### **It's an 'overestimate'**

The social cost of carbon is used in the cost-benefit analysis of some federal regulations. If the impact of emissions is deemed expensive for society, it could justify more aggressive policies to reduce their release by industry. Opponents of climate action criticized the Obama administration for raising the social cost of carbon in 2013 by almost 50 percent.

William Pizer, a Duke University professor and former Obama administration official who has worked on the estimate, applauded the Stanford researchers for applying updated observations into their carbon estimates. He and several other former Obama advisers say the administration should improve its use of updated science when establishing the price.

But Pizer also questioned the methodology of the Stanford analysis. The empirical research it relied on tracked short-term temperature spikes and their impacts on nations' economies -- not long-term trends that might show permanent economic reductions.

"To me, it just seems like it has to be an overestimate," Pizer said of the Stanford result of \$220.

"I think it's great they're doing this," he added. "I just think this is another data point that someone needs to weigh as they're trying to figure out what the right social cost of carbon is. But this isn't like a definitive new answer."

Moore acknowledged the uncertainties in her research. For example, she noted that there's not enough evidence to know if climate change will continue to have outsized impacts on poorer countries or if as their economies grow they'll be able to adapt and decrease their damage.

A grimmer outcome consists of "biophysical temperature thresholds" -- the idea that the heat will prevent large economic advances. Both scenarios effect the speed and aggressiveness with which emissions should be reduced -- and the price of their social cost of carbon.

Moore hopes the new research will help inform the administration that a larger spectrum of damages should be considered when establishing the monetary estimate.



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**To:** Li, Jia[Li.Jia@epa.gov]  
**Cc:** Wolverton, Ann[Wolverton.Ann@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]; Shouse, Kate[Shouse.Kate@epa.gov]; Fawcett, Allen[Fawcett.Allen@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]; Newbold, Steve[Newbold.Steve@epa.gov]  
**From:** Kopits, Elizabeth  
**Sent:** Tue 1/13/2015 1:19:46 PM  
**Subject:** RE: New Stanford study showing SCC six times higher than USG estimates

FYI - More press on this paper. Includes comment from Billy....

**POLICY:**

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-----Original Message-----

From: Kopits, Elizabeth

Sent: Monday, January 12, 2015 3:39 PM

To: Li, Jia

Cc: Wolverton, Ann; Griffiths, Charles; Shouse, Kate; Fawcett, Allen; Marten, Alex; Newbold, Steve

Subject: RE: New Stanford study showing SCC six times higher than USG estimates

I hadn't. Thanks for sending. Here's the Nature Climate Change article.

-----Original Message-----

From: Li, Jia

Sent: Monday, January 12, 2015 2:26 PM

To: Kopits, Elizabeth; Shouse, Kate; Fawcett, Allen; Marten, Alex; Newbold, Steve

Subject: New Stanford study showing SCC six times higher than USG estimates

FYI - you may have seen the study

<http://www.rtcc.org/2015/01/12/social-cost-of-carbon-six-times-higher-than-thought-study/>

Sent from my iPhone

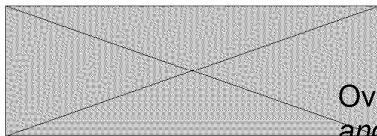
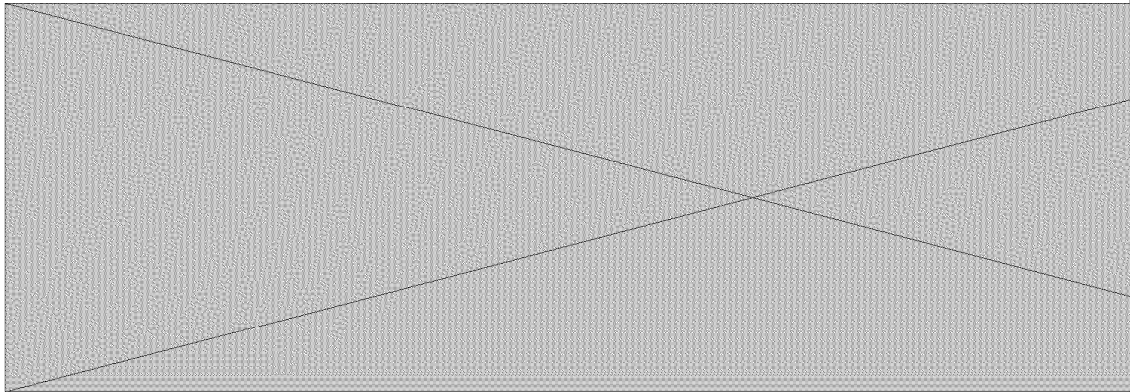
**To:** Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]; Newbold, Steve[Newbold.Steve@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]  
**From:** Wolverton, Ann  
**Sent:** Tue 1/6/2015 5:40:39 PM  
**Subject:** Fwd: The Social Cost of Carbon, Utilities in 2050, and More: See what's popular at the Energy & Climate Change Conference

Have you guys seen this?

Sent from my iPhone

Begin forwarded message:

**From:** "NCSE Conference" <[conference@ncseonline.org](mailto:conference@ncseonline.org)>  
**Date:** January 6, 2015 at 12:18:56 PM EST  
**To:** "[wolverton.ann@epa.gov](mailto:wolverton.ann@epa.gov)" <[wolverton.ann@epa.gov](mailto:wolverton.ann@epa.gov)>  
**Subject:** **The Social Cost of Carbon, Utilities in 2050, and More: See what's popular at the Energy & Climate Change Conference**  
**Reply-To:** [conference@ncseonline.org](mailto:conference@ncseonline.org)



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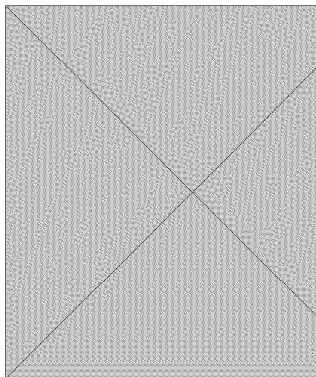
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## **The Social Cost of Carbon**

*Session organized by*

Karl Hausker,  
World Resources Institute

This panel will discuss the various steps in calculating the social cost of carbon (SCC), the weaknesses and strengths of those calculations, and how they are used to inform climate policy.

Discussants:

- Francisco de la Chesnaye, EPRI
- Laurie Johnson, Natural Resources Defense Council
- Benjamin Zycher, American Enterprise Institute

## **Earth Observations Informing Energy Management Decision Making**

*Session organized by*

Richard Eckman,  
NASA  
Ana Pinheiro  
Privette, Climate Data Solutions

This workshop seeks to enhance the dialogue between Earth science data producers who develop products and those who create the decision support systems that use these measurements for renewable and other energy applications.

Discussants:

- Greg Leng, Natural Resources Canada
- Paul Stackhouse, NASA Langley Research Center
- Scott Sklar, The Stella Group
- Marc Imhoff, University of Maryland
- Erica Zell, Battelle

## **Wood: The Real Green**

The sustainable use of wood helps to restore working lands, mitigate climate

on This symposium will explore

Geothermal This symposium will explore

how to reduce greenhouse gas emissions from the source of 29% of the world's energy supply.

Discussants:

- Brian Anderson, West Virginia University
- James Wood, U.S - China Clean Research Center, West Virginia University
- Sarah Forbes, World Resources Institute
- Robert Finley, Illinois State Geological Survey

The new Clean Power Plan will provide regulatory certainty to power companies that are making medium-and long-term investment decisions with enormous environmental and economic implications for our future.

Discussants:

- Sue Tierney, Analysis Group
- Jonas Monast, Nicholas Institute for Environmental Policy Solutions, Duke University
- Tom Peterson,

Energy

Session organized by

Paul Young, US Geological Survey

Utilities in 2050: Which Possible Futures are Likely and Desirable?

Session organized by

Paul Fikkema, Northern Arizona University

Building Material

Session organized by

Carl F. Lucero, US Forest Service

As distributed generation capacity grows in the U.S., policy should guide, rather than react to, the disruptive changes that distributed generation will bring.

Discussants:

- Amory Lovins, Rocky Mountain Institute
- Richard Caperton, OPower
- Karlynn Cory, National Renewable Energy Laboratory
- Lorenzo Kristov, California Independent System Operator

the current state of change, revitalize communities and support geothermal energy jobs and additional economies. and opportunities for the future.

Discussants:

- Mike Ritter, Forest Products Lab, US Forest Service
- William "Bill" Hohenstein, Global Climate Change Program Office, USDA
- Karl Gawell, Geothermal Energy Association
- Doug Hollett, Geothermal Technologies Office, Department of Energy
- Chris Bromley, GNS Science, New Zealand
- Milee Blount, Technology and Geospatial Services, US Forest Service
- Kenneth Bland, American Wood Council

Fund

Center for Climate  
Strategies

- Bryan Garcia, Clean  
Energy Finance and  
Investment Authority,  
Connecticut

Ian Rinehart,  
OPower  
Bruce Beihoff,  
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Energy  
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Consortium  
Gary Radloff,  
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Wisconsin-  
Madison

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SCIENTIFIC CRITIQUE OF “BEYOND 2020 — STRATEGIES AND COSTS FOR  
TRANSFORMING THE EUROPEAN ENERGY SYSTEM” - KNOPF, ET. AL., 2013

By: Richard A. Rosen\* and Edeltraud Guenther\*\*

\*Tellus Institute, 11 Arlington St, Boston MA 02446, USA

\*\*Technische Universitaet Dresden, 01069 Dresden, Germany

March 21, 2014

ABSTRACT:

Many papers on the economics of mitigating climate change are based on "model comparison exercises". Yet, these papers often simply present the results of different scenarios run by numerous models, without providing any information at all about the different model structures or the differing sets of input data so that they can be compared between models and scenarios. This paper is a recent example of such a comparison exercise published in this journal. In general, without utilizing and explicitly discussing the different model structures and input data in the course of comparing model results, there is no scientific way of concluding anything valid from the comparison exercise. This critique illustrates this important conclusion.

I. INTRODUCTION:

Following our recent paper “The Economics of Mitigating Climate Change: What Can We Know?”, we felt that it would be quite valuable to apply many of the methodological concerns we expressed there, especially those deriving from the many aspects of future uncertainty, to a significant recent piece of research in the field of the economics of mitigating climate change.<sup>1</sup> We have thus chosen to do a critique of the recent paper published in *Climate Change Economics* “Beyond 2020 – Strategies and Costs for Transforming the European Energy System” (Knopf, et.al., 2013). We have selected this paper both because it focuses on meeting greenhouse gas (GHG) emissions targets over the medium and long run (the period up to 2050) and because the analysis of how the European energy system can and should be transformed to meet the European Commission’s proposed climate targets is extremely

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<sup>1</sup> See R.A. Rosen, E. Guenther, The economics of mitigating climate change: What can we know?, Technol. Forecast. Soc. Change (2014), <http://dx.doi.org/10.1016/j.techfore.2014.01.013>. (Rosen and Guenther, 2014). There is no point to repeat all of these concerns here.



important and is currently the subject of much political debate.<sup>2</sup>

The analysis and conclusions of this paper are based on what it calls a “model comparison exercise”, which, in theory, might add some scientific clarity and weight to the original analysis of proposed 2050 GHG emissions targets previously performed by a single integrated assessment model (IAM).<sup>3</sup> However, if, for example, some of the major conclusions of the “Beyond 2020” paper cannot be justified even though they depend on a comparison of results from thirteen different IAMs, both the European public and policymakers need to know this quickly. To be clear, we do not intend to “pick on” the authors of the “Beyond 2020” paper by choosing it as the subject of our critique: we could have equally well chosen any one of many such papers describing the results of the use of integrated assessment models to quantify the mitigation costs of climate change that have been published in the last few years. Our critique of those other papers would have been similar to our critique here, highlighting the same typical flaws described in detail in our previous paper (Rosen and Guenther, 2014)

In offering this critique to the economics and climate science communities we will discuss four key points: (1) how the basic issues addressed in “Beyond 2020” are framed, (2) how the detailed analysis of these issues was conducted, (3) the extent to which the analyses done by the relevant models are valid and take uncertainty into account, and (4) the extent to which the authors’ major conclusions can, in fact, be derived scientifically from the model comparison exercise as described. Of course, much of the analysis depends on the validity of the many climate/economics model runs conducted by the authors and their colleagues in the course of the Energy Modeling Forum #28 (EMF28) project, the model comparison exercise on which the 2020 paper relies.<sup>4</sup>

In general, what we will discover in the course of our critique is that the paper does not discuss the detailed structure of the models at all, that it does not discuss how their equations were derived, that it does not even reference the documentation for most models, that it does not provide the numerical values of the input assumptions that determine the key results it is analyzing for different scenarios, and that it fails to address the implications for the model results of the inherent growing uncertainty in both model structure and model parameter values over the medium and long term.<sup>5</sup> Consequently, few of the conclusions reached throughout the paper can be scientifically justified even in the medium term (through 2030), not to speak of in the long term (through 2050). And most, if not all, of the conclusions that are justified one could reach through simple logic and reasoning based on common expert knowledge of energy systems without the need to conduct any new runs of integrated assessment models for climate change mitigation scenarios.

One key underlying problem with the EMF28 model comparison exercise was the lack of a clear plan or methodology for how such a comprehensive and scientifically valid model comparison exercise should be carried out. Certainly, no such plan is described in Knopf, et.al., 2013. Thus, the fact that the paper

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<sup>2</sup> Brigitte Knopf, et.al., Beyond 2020 – Strategies and Costs for Transforming the European Energy System, Climate Change Economics, Vol. 4, Suppl. 1 (2013) 1340001. (Knopf, et.al., 2013)

<sup>3</sup> See E3Mlab, available at: [http://www.e3mlab.ntua.gr/e3mlab/PRIMESManual/The\\_Primes\\_Model\\_2010.pdf](http://www.e3mlab.ntua.gr/e3mlab/PRIMESManual/The_Primes_Model_2010.pdf).

<sup>4</sup> Stanford University, Energy Modeling Forum 28 (EMF28) 2013.

<sup>5</sup> The only appearance of the words “uncertain” or “uncertainty” that we could find in the entire paper was on page 21, where it acknowledges that model assumptions are “highly uncertain”, a point with which we agree.

compares results from up to thirteen model outputs for various scenarios does not necessarily imply that these particular sets of results contribute in any coherent way to a scientific understanding of what a reasonable 80% greenhouse gas (GHG) mitigation plan for Europe by 2050 would be, in comparison to what can be learned from the results of just one model. For example, if the thirteen models were never run utilizing the same basic set of quantitative input assumptions, then one can never know whether differences in the results between the models for the “same” scenario are due to differences in the models’ structures or due to the differences in the set of input assumptions chosen by each model’s research team. Furthermore, in general, there were no sensitivity analyses performed by varying key input assumptions, particularly key input cost parameters, over a reasonable range of such parameters as might evolve into the future.<sup>6</sup>

## II. The Issues Raised in this Paper

According to the abstract of “Beyond 2020”, the key focus of the paper is on the changes to the European energy system “required to meet the European goal of reducing greenhouse gas (GHG) emissions by 80% by 2050. The 80% scenario is compared to a reference case that aims to achieve a 40% GHG reduction target.” (page 1) Of course, there are an infinite number of combinations of technologies that could be put into place to go from the 40% reference case to an 80% emissions reduction scenario by 2050, so what the authors mean by the changes that are “required” is unclear: required according to what set of criteria? The abstract then states that “a common finding across the scenarios and models is the prominent role of energy efficiency and renewable energy sources” in causing the incremental emissions reduction. Everyone working in this field of research has known for decades that enhanced energy efficiency and additional renewable energy sources are two of the main generic technology options for reducing GHG emissions in the 80% scenario relative to the reference case, so that is hardly a finding of this paper. Information on renewable energy supply options and enhanced energy efficiency are technology *inputs* to the analysis. This claimed “finding” of the paper is true simply by virtue of the definition of the concept of “mitigation” when applied to energy systems, though the exact proportional role that these technologies will play in causing the incremental emissions reductions will vary somewhat from scenario to scenario and model to model.

The abstract then goes on to state that “wind power and bioenergy increase considerably beyond current deployment levels”. (page 2) This, again, is hardly surprising, but it is, at least, a true finding of this research. For example, depending on the technology cost and operating assumptions used by each modeling team, solar photovoltaics and geothermal-based district heating, rather than wind power and bioenergy, could have been the best supply-side options for renewables. So why wind and bioenergy dominate the renewable supply results for most, if not all, of the thirteen models relied on is a finding that this paper should explore in further detail in order to convince the reader of its validity. To accomplish this, needless to say, the paper should have listed the main cost and operating parameter assumptions as they vary over time for each major renewable technology, for each model, in each scenario, in each future year. Then, the reader might have been able to get sense of whether or not, and to what extent, different cost assumptions, rather than other factors or constraints built into the

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<sup>6</sup> The only cases that may represent “sensitivity analyses” are the “Green” cases described in Table 1, page 5, where lower capital costs might have been utilized for certain unspecified renewables for some model runs.

models, were responsible for the finding noted above. But this analysis was not done.

The abstract next states that “mitigation becomes more challenging after 2040”. (page 2) Unfortunately, the term “more challenging” is not defined, so our understanding of this finding is also left somewhat up in the air. “More challenging” might mean “more expensive” on an incremental basis, but that is not clear from the text. Given that these “findings” described above are the three main points summarized in the abstract, what this paper has to offer in terms of new understandings of the energy system transition needed in Europe to mitigate GHGs is not clear.

In the paper’s introduction, the authors continue by saying, “However, earlier model comparison projects have taught us that [optimal?] mitigation strategies vary significantly across models. In light of this, it seems that a multi-model perspective is valuable for formulating robust and effective energy and climate policies.” (page 3) Put into more straightforward language, these sentences seem to mean two things. (1) Based on potentially different criteria for optimizing different equations, different model structures, and different input assumptions, different models have produced different mitigation strategies at different times in the past for similar scenarios. (2) Therefore, comparing and contrasting the results from different model runs may (or may not) help policymakers formulate robust and effective climate change mitigation policies for the future. Again, whether or not (2) is true depends on how the analysis comparing model results is carried out.

Next, the paper describes its key research questions: (A) “Technologies and sectors: Which are the most important technologies enabling the GHG reduction target to be met across the EU in a cost-effective manner? Are some technologies irrelevant or ambiguous? What is the most cost-effective allocation of emission reductions across sectors?” (page 3) and (B) “Targets and timing: What are the implications of different long-term targets for shorter-term actions in terms of the timing of mitigation and for specifying targets? Are the EU 2020 targets sufficient to meet the long-term target of reducing GHG emissions by 80% by 2050? What does this imply for determining appropriate targets in 2030 and 2040? How do the costs of the transformation develop over time?” (page 3)

From our perspective, the key concept introduced here is that of “cost effectiveness”, which is one kind of optimization criteria. That is clear from the research questions raised under group (A) above. But the reader also needs to understand that the cost effectiveness criterion, however defined, is also crucial for determining the answers to the questions under group (B). The impact of the cost effectiveness criterion on the group (B) questions, however, is somewhat subtle. This criterion determines the time sequencing of the implementation of the different mitigation technologies (the technology portfolios) over the entire period from 2010 to 2050 as derived from the actual cost and operating parameter assumptions for each mitigation technology. Once this “cost-effective” sequence for implementing mitigation technologies is determined for any particular model run, then one can answer the group (B) questions.

Unfortunately, this paper does not explain this point to the novice reader or policymaker, though, of course, all modelers know this. However, because the thirteen different models relied on in EMF28 utilize at least five different cost or cost effectiveness criteria, which cannot directly be compared to

each other as the paper acknowledges, the time sequence of the implementation of mitigation technologies could differ from model to model for the exact same scenarios and input parameter assumptions just because the cost effectiveness criteria used differs between the models. Unfortunately, the paper never presents a detailed discussion, or even an illustrative example, of the extent to which this could be true.

Importantly, somewhat further on, the paper states, “This exercise [the EMF28 project] has two goals. The first is to identify common technological requirements and technology portfolios by analyzing the various low carbon pathways produced by the models. The second is to understand the extent to which variations in results are due to assumptions inherent in the input data, and the extent to which they are explained by methodological differences. The underlying research question is whether different types of models tell different stories about Europe’s decarbonization pathway, or whether there is a shared view on cost-effective strategies.” (page 3) This framing of the paper’s goals makes clear that each model’s definition of “cost effectiveness” is going to play a major role in determining the desirable mitigation pathways for each scenario, as we pointed out above. But we must also determine whether or not the second goal noted above was actually achieved, or even explicitly addressed, i.e., does the paper actually accomplish the task of determining the extent to which the different results from different models are due to the different input assumptions or due to the different model structures and equations (methodological differences)? The answer, as we shall clearly see, is “no”.

### III. Our Analysis of the Issues Raised

In order to determine the extent to which the EMF28 model comparison exercise provides additional insights into how Europe could and should move from a scenario with a 40% reduction in greenhouse gas emissions by 2050, to one with an 80% reduction, that could not be obtained *without* running IAM models, let us review one of this paper’s key conclusions as stated in section 5. The authors remind us that the EMF28 model comparison exercise was “used as a tool to determine what the EU energy system transition should look like in order to meet the EU’s emission reduction goals.” They then claim that the results of this model comparison exercise will help to “assess the robustness of the Energy Roadmap”.

Unfortunately, the term “robustness” is never defined either, so we will also have to guess at its meaning. We will assume here that an Energy Roadmap is “robust” if it is close to the technology implementation pathway that would be produced by most of the models under a reasonably wide range of input assumptions. In contrast, if there were alternative sets of perfectly reasonable model input assumptions that led to very different technology portfolios over time in different model runs for the 80% emissions reduction scenario, then the roadmap generated from any single set of input assumptions could not be labeled “robust”.

Unfortunately, the paper does not provide any tables or charts listing or describing the technology portfolios for any specific model or scenario to any reasonable degree of detail to determine the robustness of any particular roadmap. In fact, Figures 1 and 2 illustrate the very large differences between the emissions and energy consumption results for different models for each scenario type.

Similarly, Figures 3 to 7 only present the ranges of percent implementation of technologies *aggregated across all the models*, not for *individual* models, so one cannot determine if a technology mix was robust for any particular type of scenario. However, given the spread of percent penetration for each technology, the results for technology mix were apparently not “robust” at all. As stated above, since the paper provides no input assumption values and does not systemically vary them, as far as we can tell from the paper and our prior knowledge of IAM research, the input assumptions cannot be paired in any systematic way with the actual results of runs from a given model for a specific scenario. Thus, without knowing the range of input assumption values used for any given model, and for all the models collectively, one cannot possibly make any judgments about whether or not the results for the 80% reduction scenario are “robust” over the full range of reasonable input assumptions.

The first finding actually presented in section 5 (the conclusion) of the paper is that “despite the models’ differences, there are several pathways for achieving ambitious climate change mitigation in Europe” with only a moderate reduction in GDP (less than 0.7% by 2030 and below 2.3% by 2040)”. (page 31) However, the authors continue, in some model runs that reach an 80% reduction in GHG emissions by 2050, “costs increase considerably after 2040.” (Note: The paper considers a reduction in GDP to be a “cost” to society (rather than a benefit). This is a rather strange definition of “cost”, since a more efficient economy might have a lower GDP without any diminishment of life style or physical consumer consumption. However, this is a separate issue, which we will not pursue here.) Furthermore, the use of the phrase “despite the models’ differences” above is quite odd because the several pathways that result may be *due* to the models’ differences, as even the authors realize is possible.

In order to evaluate the claim about the accelerating cost impact of reducing GHGs by an incremental 40% (from 40% to 80% reductions) on Europe’s GDP in the long run (after 2040), we must first ask whether or not the climate/economic IAMs used in the EMF28 project are capable of calculating the incremental impact of climate change mitigation on the GDP nearly as precisely as indicated in figures 10 and 11. This is an especially important question given all the uncertainties inherent in both the future values of the input parameters to each model for all mitigation technologies, among other types of parameters, and whether or not the equations themselves would be valid that far into the future.

Furthermore, what the authors call a “moderate” cumulative reduction in GDP of 0.7% from 2010 to 2030 implies that the average *annual* reduction per year would be only 0.035%. Clearly, this is not a “moderate” annual reduction: it is an extremely small annual reduction. It is probably well within the “error bars” for measuring GDP changes in any given year using any macro-economic model. Similarly, even if the *cumulative* incremental change in GDP increased by another 1.6% (2.3% minus 0.7%) over the 10 years from 2030 to 2040, the implied incremental annual average change would be only 0.16%, barely measurable at best. In addition, these very small incremental changes in annual GDP produced by the models on which the EMF28 project relied must be evaluated in the context where hundreds of their input parameters (both cost and operating characteristics) must be estimated for the next 40 years (2010-2050). This must be done separately in the 40% reduction scenario and the 80% reduction scenario. However, we claim that no one knows any of these parameter values very accurately at all as far ahead in time as 2050 (or even to 2030), not to speak of how each parameter trajectory might differ between the 40% and 80% scenarios. This is where uncertainty has a huge potential impact on the

EMF28 results, but this issue is never discussed in “Beyond 2020” so that European policy makers can appreciate this crucial weakness in this analysis, and in all possible analyses.

For example, with respect to a very simple parameter needed as an input to all the models, what would the cost of a wind turbine per kilowatt of capacity be in the 40% as opposed to in the 80% GHG reduction scenario? Since more wind turbines will likely be sold and manufactured in the 80% reduction scenario than in the 40% reduction scenario, will “learning by doing” bring down the unit cost of such turbines, and if so, by how much? Will the difference in cost per kilowatt of capacity be \$10 or \$100, or more? Clearly, no one knows the answer such a long time ahead, but the answer for just this single cost parameter could have a dramatic effect on whether the net costs of mitigation in going from a level of 40% to 80% in GHG reductions is positive or negative, not to speak of the absolute magnitude of the cost difference in every year. Since the net GDP impacts (or other types of “cost” impact) cited above as calculated by the models utilized in the EMF28 project depend on dozens, if not hundreds, of differential costs such as these for at least 40 years into the future, we would have to know the full set of these differential costs in order to have any confidence at all in the total cumulative difference in GDP results.

In fact, it would be interesting to know just how many of the 13 models used in EMF28 even have different cost or operating parameter assumptions for any of the key mitigation technologies between the 40% and the 80% GHG reduction scenarios. Again, one of the major problems affecting this, and most other papers on the economics of mitigating climate change, is that none of the key cost and operating input parameters are provided for any of the models relied on. The range of parameter values is, then, not even known across all such IAMs. There is thus no basis in the “Beyond 2020” paper for judging whether or not differences between model results for the same scenario are due to the differences in cost optimizing definitions, model structures, model input data, or all three types of differences, which is most likely.

If these scenarios were modeled correctly, one possible implication of having lower wind turbine costs in the 80% reduction scenario than in the 40% reduction scenario is that by 2050 the GDP would be somewhat lower in the 80% reduction scenario, for this reason alone. However, this reduction in GDP would be a good thing for society, not a bad thing, as this paper (and others) implies. Even if the models used were perfect from a structural perspective, such attempts at making accurate calculations of future GDP would run afoul of the inherent and significant uncertainties in all the key model input parameters, especially in the cost parameters.

Note that another example of uncertain, but very important, input cost parameters is the prices of fossil fuels in future. Since the demand for fossil fuels will likely be far higher in the 40% GHG reduction scenario than in the 80% reduction scenario, where consumption of fossil fuels would likely be much lower, an extensive discussion of this difference in fossil fuel prices through 2050 in each model, and their impact on the results, would clearly enhance the credibility of this paper as well as the reader’s understanding of the results. The reader does not know if any of the thirteen modeling teams used different fossil fuel prices in different scenarios, what the prices were, or what the basis for such prices was. Yet, in theory, differences in fossil fuel prices could alone explain all the differences in model results for cost (GDP) impacts and technology portfolios as reported.

The second main conclusion in section 5 is that “it is critical to start a structural transformation of the fossil fuel-based energy system prior to 2030.” (page 31) The implicit message here seems to be that beginning the transformation by 2030, rather than after, would be cheaper for society in the long run. However, while this second main conclusion is likely to be true, when dealing with a cost-minimizing (or similar) optimization approach to finding economic model solutions, the longer the time period one has over which to minimize cost, the lower the total cost is. Thus, starting the transformation at some level of activity sooner will almost certainly allow for lower cost solutions than if one waits. But this is a simple mathematical conclusion that can be drawn from knowledge of how optimization models work without running any specific models.

#### IV. Further Analysis of the Paper’s “Cost” Results

One of the more interesting benefits of using IAMs to analyze the EU’s proposed Energy Roadmap could, in principle, be to acquire some sense of the likely range of the incremental cost (or cost effectiveness) results for achieving the 80% GHG mitigation levels, if there is any benefit at all from using IAMs to study the EU’s GHG reduction goals. However, even in principle, reasonably valid cost projections obtained from any single model based on any single set of input cost assumptions would probably be limited to 10 to 20 years into the future at most before the underlying uncertainties for both model structure and cost and operating parameter inputs take over and completely undermine the usefulness of reporting cost results. Given that the base year for most of the models was 2010 or earlier, cost projections beyond 2030 (or even earlier) probably have little or no scientific validity. However, we see from Figure 10 that only *after* 2030 do any interesting or significant differences occur in net mitigation costs between models actually run, given the input cost parameters assumed. Thus, given the lack of differences in cost results through 2030, it is particularly surprising that the authors do not even mention how increasing uncertainty after 2030 might affect the various input values and equation structures, not to speak of to what extent the rapidly increasing impact of uncertainty might vitiate all their basic findings for after 2030, as reported in figures 10 and 11.

Stepping back, then, we need to ask how a scientific paper like “Beyond 2020” should treat uncertainty when attempting to make forecasts for more than 10 to 20 years. First of all, the paper should present, in detail, a discussion of all the types of uncertainties that might significantly impact its projections, with numerous illustrative examples. Of course, two very important sources of uncertainty that spring to mind are the uncertainties that are implicit in each equation of the underlying macroeconomic model of the economy and the uncertainties that exist when trying to determine an appropriate set of cost and operating parameter input assumptions for any given technology and scenario for the long-term future. (These points have already been discussed above.) The first type of uncertainty is especially important when a model consists of coupled sets of nonlinear equations, as these models do, because uncertainties that affect nonlinear models can lead to dramatically different futures depending on how the uncertainties are taken into account and the magnitude of the parameter values within each equation.

The second type of uncertainty is critical when using any type of model where net costs represent relatively small differences between the large absolute costs of different long-term scenarios. Of

course, a third kind of question that such a scientific paper must address is whether all the relevant types or categories of cost that would comprise the total net costs and benefits of a scenario like the 40% DEF scenario in comparison to the 80% DEF scenario are even included.

Again, it is very surprising that the authors of this paper do not even bother to inform the reader that many significant cost components are (or may be) entirely omitted from the various models used. For example, while no documentation is provided in this paper for any of the thirteen models, none of the models appear to attempt to quantify the economic damage done to the earth's ecology and economy due to climate change in each scenario. Thus, the 80% mitigation scenario is not given any economic "credit" for having avoided some degree of damages that would have occurred in the 40% mitigation scenario. Yet since one of the main purposes of attempting to mitigate climate change in the first place is to reduce damages due to climate change, this issue should have been discussed.<sup>7</sup> Of course, climate-induced damages would directly affect the calculations of GDP, but they would also affect other types of cost effectiveness calculations as a component of gross cost.

Furthermore, our assumption is that none of the models run for the EMF28 project include the investment costs required to increase the level of energy efficiency of various demand-side technologies in any given scenario, since such investment costs are never mentioned. This lack of investment inputs for enhanced energy efficiency is typical of many, but perhaps not all, IAMs. Again, one cannot know if any exceptions to this claim exist for models like PACE or EPPA, which do achieve well above average rates of improvement in energy intensity, since the topic of investment costs for enhanced energy efficiency is never discussed in the paper. Furthermore, one cannot tell which infrastructure costs are or are not included in which models when energy supply-side investments are made to modify the carbon intensity of the energy utilized, since the paper only mentions two excluded cost categories explicitly. (page 25)

For example, are oil and gas pipeline costs or electricity transmission costs included? Are electricity distribution system costs included, and to what degree are the investment requirements of expanding public transportation systems included in any models or scenarios? Do any of the models even allow increases in the usage of public transportation relative to private vehicles at different rates in the future from scenario to scenario, and to what degree? These types of infrastructure costs (if omitted) would likely be so large that they would swamp the net cost results for the costs included in the models when changes in GDP are reported in figures 10 and 11. At a more subtle level, structural changes that are likely to occur in the economy in one kind of scenario relative to those in another type of scenario may not be reflected in the equations used in each model. Structural changes in the economy could also affect calculations of the GDP.

Thus, without having run a sufficiently wide range of sets of scenario input assumptions in a systematic way with each model, the changes in GDP (or cost effectiveness) results from model to model, and from

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<sup>7</sup> Most IAMs used to study the cost of mitigating climate change, especially those referenced in IPCC climate assessments, do not include damage costs. However, this does not excuse the lack of discussion of this issue, especially in papers intended for policymakers, since this type of cost could overwhelm all the other modeling results with respect to the costs and benefits of different policy scenarios.



scenario to scenario as reported, cannot be properly interpreted or understood.<sup>8</sup> Most probably, again, only a single set of input assumptions was used for each model independent of scenario (except for the Green cases, which were hardly discussed in the report). Furthermore, the lack of uncertainty analysis in the paper completely invalidates all of the authors' interpretations of the cost results (as described in section 3.2) and the technology mix results (discussed at length throughout the report). In particular, without having run all the models with the *exact same* set of cost and operating parameter data as input assumptions (to the extent possible given different model structures) for each type of scenario, the authors can have no idea how to interpret the different cost and technology mix results from model to model and from scenario to scenario.

## V. Conclusions

Based on the analysis presented above, we find the following:

1. Most of the valid conclusions of the "Beyond 2020" paper are *qualitative* in nature and do not require the running of any of the models that were run for the EMF28 project in order to determine their truth. Any energy systems expert could validate these conclusions.
2. The models run for the EMF28 exercise contribute little or nothing towards understanding the feasibility, robustness, net costs and benefits, and reasonableness of the "Beyond 2020" GHG reduction targets through 2050.
3. None of the long-term cost/benefit results, or technology mix results, through 2050 have any reasonable scientific credibility, in part because the time horizon for which they have been projected is far longer than can be justified relative to the increasing types and degree of uncertainty that will affect both model structure and input parameter values as the future unfolds. In addition, several key types of cost were omitted from the EMF28 project entirely, further undermining the net cost/benefit results.
4. No analysis of uncertainty of any type, and its likely impact on the paper's claimed results, was performed.

As Michael Chwe recently stated in the *New York Times*,

"Science is in crisis just when we need it most. A major root of the crisis is selective use of data. Scientists, eager to make striking new claims, focus only on evidence that supports their preconceptions. Psychologists call this 'confirmation bias'. We seek out [use] information that confirms what we already believe."<sup>9</sup>

We hope this is not what is going on when large numbers of IAM research teams do not even tell readers of their research papers what equations and numerical assumptions they are making, so that these assumptions cannot be challenged, and others used in their place.

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<sup>8</sup> Six of the thirteen IAMs yielded GDP outputs, while the other seven models yielded other forms of cost effectiveness results.

<sup>9</sup> Michael Suk-Young Chwe, *Scientific Pride and Prejudice*, *New York Times* (Sunday Review), January 31, 2014.

**To:** Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; Wolverton, Ann[Wolverton.Ann@epa.gov]; Newbold, Steve[Newbold.Steve@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]  
**From:** Marten, Alex  
**Sent:** Mon 1/5/2015 11:10:17 PM  
**Subject:** FW: "The Comparative Impact of Integrated Assessment Models' Structures on Optimal Mitigation Policies"

Cleaning out my inbox I came across this email from Ann...

Wanted to recirculate to ensure that we keep the RESPONSE model in mind

--

Alex L. Marten  
phone: (202) 566-2301  
email: [marten.alex@epa.gov](mailto:marten.alex@epa.gov)

**From:** Wolverton, Ann  
**Sent:** Thursday, August 14, 2014 12:38 PM  
**To:** Bowen, Jennifer; Dockins, Chris; Evans, DavidA; Ferris, Ann; Garbaccio, Richard; Griffiths, Charles; Klemick, Heather; Kopits, Elizabeth; Marten, Alex; McGartland, Al; Moore, Chris; Newbold, Steve; Pasurka, Carl; Sargent, Keith; Shadbegian, Ron; Sheriff, Glenn; Simon, Nathalie; Simpson, David; Snyder, Brett  
**Subject:** "The Comparative Impact of Integrated Assessment Models' Structures on Optimal Mitigation Policies"

Of possible interest....

"The Comparative Impact of Integrated Assessment Models' Structures on Optimal Mitigation Policies"

FEEM Working Paper No. 58.2014

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PATRICE DUMAS, Centre De Coopération Internationale En Recherche Agronomique Pour Le Développement (CIRAD)

This paper aims at providing a consistent framework to appraise alternative modeling choices that have driven the so-called “when flexibility” controversy since the early 1990s dealing with the optimal timing of mitigation efforts and the Social Cost of Carbon (SCC). The literature has emphasized the critical impact of modeling structures on the optimal climate policy. But, to our knowledge, there has been no contribution trying to estimate the comparative impact of modeling structures within a unified framework. In this paper, we use the Integrated Assessment Model (IAM) RESPONSE to bridge this gap and investigate the structural modeling drivers of differences in climate policy recommendations. RESPONSE is both sufficiently compact to be easily tractable and detailed enough to capture a wide array of modeling choices. Here, we restrict the analysis to the following emblematic modeling choices: the forms of the damage function (quadratic vs. sigmoid) and the abatement cost (with or without inertia), the treatment of uncertainty, and the decision framework (one-shot vs. sequential). We define an original methodology based on an equivalence criterion to carry out a sensitivity analysis over modeling structures in order to estimate their relative impact on two output variables: the optimal SCC and abatement trajectories. This allows us to exhibit three key findings: (i) IAMs with a quadratic damage function are insensitive to changes of other features of the modeling structure, (ii) IAMs involving a non-convex damage function entail contrasting climate strategies, (iii) Precautionary behaviours can only come up in IAMs with non-convexities in damages.

**To:** Bowen, Jennifer[Bowen.Jennifer@epa.gov]; Dockins, Chris[Dockins.Chris@epa.gov]; Evans, DavidA[Evans.DavidA@epa.gov]; Ferris, Ann[Ferris.Ann@epa.gov]; Garbaccio, Richard[Garbaccio.Richard@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]; Klemick, Heather[Klemick.Heather@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]; McGartland, Al[McGartland.Al@epa.gov]; Moore, Chris[Moore.Chris@epa.gov]; Newbold, Steve[Newbold.Steve@epa.gov]; Pasurka, Carl[Pasurka.Carl@epa.gov]; Sargent, Keith[Sargent.Keith@epa.gov]; Shadbegian, Ron[Shadbegian.Ron@epa.gov]; Sheriff, Glenn[Sheriff.Glenn@epa.gov]; Simon, Nathalie[Simon.Nathalie@epa.gov]; Simpson, David[Simpson.David@epa.gov]; Snyder, Brett[Snyder.Brett@epa.gov]  
**From:** Wolverton, Ann  
**Sent:** Tue 5/5/2015 6:38:22 PM  
**Subject:** What Do We Learn from the Weather? The New Climate-Economy Literature  
[Dell et al climate weather JEL 2014.pdf](#)

Fairly new survey article in JEL – I haven't read it but thought it might be of interest to folks.

Ann

**To:** Heninger, Brian[Heninger.Brian@epa.gov]  
**Cc:** Griffiths, Charles[Griffiths.Charles@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]  
**From:** Matthew Ranson  
**Sent:** Wed 3/11/2015 1:20:57 PM  
**Subject:** RE: Extreme Weather and SCC

Hi Brian,

Thanks--this is interesting. Nice to see EPA's SCC work being cited.

Matt

**Matthew Ranson, Ph.D | Associate | Abt Associates**

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**From:** Heninger, Brian [mailto:Heninger.Brian@epa.gov]  
**Sent:** Tuesday, March 10, 2015 9:00 AM  
**To:** Matthew Ranson  
**Cc:** Griffiths, Charles; Marten, Alex  
**Subject:** Extreme Weather and SCC

Hi Matt,

Not sure if you see these things (e.g. ClimateWire) but this was in today's edition.

Extreme Weather piece is interesting, given your current work, and also here's yet another piece on SCC.

The second article on SCC links to EPA's SCC page :  
<http://www.epa.gov/climatechange/EPAactivities/economics/scc.html>

-Brian

<http://www.eenews.net/climatewire/2015/03/10/stories/1060014746>

## **Cabinet secretaries warn city leaders about costs of extreme weather**

Scott Detrow, E&E reporter

Published: Tuesday, March 10, 2015

Speaking to the National League of Cities' Congressional City Conference yesterday, Interior Secretary Sally Jewell quipped that the Obama administration should have held a Cabinet meeting at the Washington, D.C., conference. Jewell was the fourth Cabinet member to address the gathering of local leaders that afternoon. Earlier in the day, President Obama spoke to the group, too.

Energy Secretary Ernest Moniz, U.S. EPA Administrator Gina McCarthy and Transportation Undersecretary Peter Rogoff -- substituting for Anthony Foxx, who is recuperating from knee surgery -- focused their panel discussion on the effects that climate change will have on local infrastructure.

"A lot of people don't know this, but many of the transit tunnels and highway tunnels that flooded under Hurricane Sandy had just flooded a year earlier in Hurricane Irene," Rogoff said, arguing for the need for projects to anticipate extreme weather events.

"Far less newsworthy. But it makes the point that if we're going to have increasing frequency of major climatic conditions -- when the president provided that money for Hurricane Sandy, he made the point that the taxpayers should not have to pay to clean up these critical facilities time and time again -- we need to build them smarter. We need to build them in a fashion that they can withstand the future," he explained.

Moniz hinted that the Department of Energy's upcoming Quadrennial Energy Review -- due in "a few weeks" -- will delve into similar issues. "Risks from storm surges, for example. Our modeling there showing Category 1 storms could inundate about a thousand vital electric substations, for example, over these next decades. Heat waves degrading our infrastructure, but also increasing things like peak cooling requirements."

Fitting for a gathering of local officials, much of the discussion revolved around federal grants and partnership programs. Moniz announced that the Department of Energy had awarded \$6 million for 11 local efforts aimed at expanding the footprint of electric plug-in vehicles and other alternative fuels.

### **Cities can help states get clean energy funds**

McCarthy acknowledged that EPA "does not have the zeros on the end of its budget that these guys [the Energy and Transportation departments] do" when it comes to grants but did point out more than 40 percent of the agency's

annual budget goes directly to states, municipal governments and tribes.

She argued that the Clean Power Plan, which aims to reduce the power sector's greenhouse gas emissions to 30 percent below 2005 levels over the next 15 years, could provide cities an opportunity for smart infrastructure growth.

"We are opening up opportunities for states to think more creatively and flexible about how to work with you to bring advantage, economically, and job growth in the choices they make in how to reduce their carbon pollution," McCarthy said. "They can do it if they want to, so get active in those discussions with your states."

The proposed rule requires states to lower their carbon footprints by transitioning away from coal-fired power plants and toward low- and zero-carbon fuel sources like natural gas, wind and solar. The Obama administration has touted the plan's third and fourth building blocks, which expand renewable energy and energy efficiency programs, as economic boons.

McCarthy touted a proposed \$4 billion program in Obama's budget that would help fund programs in states that attempt to go beyond their assigned Clean Power Plan goals. But the Republicans who control both the House and Senate have made it clear that they are not inclined to approve that funding (*ClimateWire*, Feb. 3).

<http://www.eenews.net/climatewire/2015/03/10/stories/1060014747>

## **Fossil fuel prices don't reflect true cost of carbon, report says**

Manon Verchot, E&E reporter

Published: Tuesday, March 10, 2015

Prices at the pump don't reflect the true cost of fossil fuels, according to a new study. When you add together the environmental, health and social costs of continuing business as usual with fossil fuel extraction and use, all of society gets billed, not just the consumer, it finds.

The bill may not show up when the tank is full, but it manifests itself in health care costs and environmental damages. For every gallon of gasoline, society gets a \$3.80 extra charge, while for every gallon of diesel, the cost is an additional \$4.80, the study says. Natural gas costs twice as much, and coal-fired electricity costs four times as much.

"Solar and wind are not so expensive when you consider the hidden costs of fossil fuels," said Drew Shindell, a professor of climate sciences at Duke University, who conducted the study. His work is the first to link the cost of air pollution and the release of carbon into the atmosphere in the same study.

"The people working on climate are not always the same people working on air quality -- they're different skill sets; they use different models," said Jason Hill, an associate professor at the University of Minnesota, who did not contribute to the research. "It's really good to see people looking at air quality impacts alongside climate change."

## Some costs not included

Shindell evaluated the effects of atmospheric release of air pollutants, like methane and aerosols, and the effects of carbon release on human health and the environment. He found that what car owners may not pay in fueling their car, they may pay in hospital bills when their child has an asthma attack. And if the car owner isn't paying, someone else in society is.

These costs also extend to other health risks, including premature death and costs of missed work and school days. On an environmental scale, society is paying for all the lower or failed crop yields and the extreme weather events linked to climate change, according to the study. As long as markets don't place a price on emissions, polluters will not pay for these costs, Shindell said.

"We care about the social cost of carbon or the social cost of atmospheric release because we want to make good choices and we want to make informed choices," Hill said.

Understanding the social cost of carbon and atmospheric pollutants can help countries develop policies and market barriers to address the risks. U.S. EPA uses these calculations to assess whether rulemakings have climate benefits. But there are limitations that make calculating these costs difficult.

These types of studies don't establish who is most affected by problems. They also can't account for all the factors that will influence societal cost, including issues like ocean acidification and biodiversity. For example, climate change has been linked to mental health issues, while air pollution can be linked to reduced IQ, but neither one of these factors has been sufficiently studied to accurately calculate their costs, which means that any social cost of carbon is a conservative estimate, according to Shindell.

Still, knowing that the cost of carbon and air pollution is high, even without including additional factors, can be informative. "I think it helps people make better choices," Shindell said.

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**To:** Griffiths, Charles[Griffiths.Charles@epa.gov]  
**From:** Marten, Alex  
**Sent:** Tue 1/27/2015 7:06:18 PM  
**Subject:** RE: Extreme weather draft

sounds good

--

Alex L. Marten  
phone: (202) 566-2301  
email: marten.alex@epa.gov

**From:** Griffiths, Charles  
**Sent:** Tuesday, January 27, 2015 1:13 PM  
**To:** Marten, Alex  
**Subject:** Re: Extreme weather draft

Thanks, Alex. I would be happy for you to engage at any point you wish but, honestly, I don't think we need more than one individual reading and commenting on this at this point. When we get a more complete draft I'll let you know and you can read it at that point.

Charles

---

**From:** Marten, Alex  
**Sent:** Tuesday, January 27, 2015 6:12 AM  
**To:** Griffiths, Charles  
**Subject:** Fw: Extreme weather draft

Charles,

To be honest, I have completely pushed this work to the back of my mind. Please let me know when it's a stage you would like me to engage.

Thanks.

--

Alex Marten

[marten.alex@epa.gov](mailto:marten.alex@epa.gov)

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**From:** Heninger, Brian  
**Sent:** Monday, January 26, 2015 5:02 PM  
**To:** Griffiths, Charles; Marten, Alex  
**Subject:** Fw: Extreme weather draft

Given Matt's comments, I wouldn't put too much, if any time into this, and recall we are NOT meeting tomorrow at 10:00. But if you do have any thoughts on the direction he is taking in this draft, let me know, and I will reply to him.

Thanks, -Brian

---

**From:** Matthew Ranson <[Matthew\\_Ranson@abtassoc.com](mailto:Matthew_Ranson@abtassoc.com)>  
**Sent:** Monday, January 26, 2015 3:30 PM  
**To:** Heninger, Brian  
**Subject:** SCC: Extreme weather draft

Hi Brian,

As promised, here's our current working draft of the extreme weather report. We've added a lot of material, rearranged subsections, and added a bunch of internal comments and notes. Since this is very much a messy work-in-progress, I wouldn't recommend distributing to the SCC team for review yet--better to wait until we have a solid draft.

Thanks,

Matt

**Matthew Ranson, Ph.D | Associate | Abt Associates**

55 Wheeler Street | Cambridge, MA 02138

O: 617.520.2484 | F: 617.386.7568 | [www.abtassociates.com/environment](http://www.abtassociates.com/environment)

---

This message may contain privileged and confidential information intended solely for the addressee. Please do not read, disseminate or copy it unless you are the intended recipient. If this message has been received in error, we kindly ask that you notify the sender immediately by return email and delete all copies of the message from your system.

**From:** Kopits, Elizabeth  
**Location:** charles' office  
**Importance:** Normal  
**Subject:** discuss FS SCC question  
**Start Date/Time:** Thur 7/16/2015 3:00:00 PM  
**End Date/Time:** Thur 7/16/2015 3:30:00 PM

**From:** McGartland, Al  
**Location:** Al's Conference Room  
**Importance:** Normal  
**Subject:** SCC Team Check Meeting - Elizabeth K.  
**Start Date/Time:** Thur 7/23/2015 6:00:00 PM  
**End Date/Time:** Thur 7/23/2015 6:30:00 PM

**From:** Poole, Jacqueline  
**Location:** DCRoomARN3500/OPEI  
**Importance:** Normal  
**Subject:** SCC-NAS Update  
**Start Date/Time:** Tue 7/28/2015 2:00:00 PM  
**End Date/Time:** Tue 7/28/2015 2:30:00 PM

**From:** Poole, Jacqueline  
**Location:** DCRoomARN3500/OPEI  
**Importance:** Normal  
**Subject:** SCC-NAS Update  
**Start Date/Time:** Fri 7/24/2015 2:00:00 PM  
**End Date/Time:** Fri 7/24/2015 2:30:00 PM

**From:** Kopits, Elizabeth  
**Location:** charles' office?  
**Importance:** Normal  
**Subject:** scc check in - file organization  
**Start Date/Time:** Tue 7/7/2015 3:30:00 PM  
**End Date/Time:** Tue 7/7/2015 4:00:00 PM



**From:** Beauvais, Joel  
**Location:** DCRoomARN3500/OPEI  
**Importance:** Normal  
**Subject:** SCC-NAS Update  
**Start Date/Time:** Tue 7/28/2015 2:30:00 PM  
**End Date/Time:** Tue 7/28/2015 3:00:00 PM

**From:** Heninger, Brian  
**Location:** Charle's Office  
**Importance:** Normal  
**Subject:** SCC - Abt's Extreme Weather Draft and Completing Work Assignment  
**Start Date/Time:** Wed 5/20/2015 7:30:00 PM  
**End Date/Time:** Wed 5/20/2015 8:00:00 PM  
[Extreme Weather Lit Review Draft - 2015-05-01.docx](#)

Discuss draft on Extreme Weather with Matt and final steps to complete work assignment.

Matt - I will arrange to sign you into the building

**From:** Heninger, Brian  
**Location:** NCEE will call Abt/Matt at his office from Charles Office  
**Importance:** Normal  
**Subject:** Social Cost of Carbon - (Periodic Check-in)  
**Start Date/Time:** Tue 4/14/2015 5:00:00 PM  
**End Date/Time:** Tue 4/14/2015 5:30:00 PM

Rescheduled Time

**Social Cost of Carbon** - Work Assignment #4-87 (Periodic Check-in) - non-reoccurring - will set up separate meetings as needed.

NCEE location: Charles office, unless I designate a room or call in number as needed based on participation.

NCEE will call Matt at his office (617-520-2484).

-----  
Brian Heninger  
Economist / OP Quality Assurance Manager  
U.S. Environmental Protection Agency  
Office of the Administrator, Office of Policy (OP)  
National Center for Environmental Economics  
202-566-2270

**From:** McGartland, Al  
**Importance:** Normal  
**Subject:** SCC status update  
**Start Date/Time:** Wed 4/1/2015 4:00:00 PM  
**End Date/Time:** Wed 4/1/2015 5:00:00 PM

**From:** Wolverton, Ann  
**Location:** DCRoomWest4424G/OPEI  
**Importance:** Normal  
**Subject:** climate and international team meeting  
**Start Date/Time:** Thur 4/16/2015 5:00:00 PM  
**End Date/Time:** Thur 4/16/2015 6:00:00 PM

Untitled

Untitled

Untitled

Untitled

Untitled

**From:** McGartland, Al  
**Importance:** Normal  
**Subject:** Copy: SCC status update  
**Start Date/Time:** Wed 4/1/2015 4:00:00 PM  
**End Date/Time:** Wed 4/1/2015 5:00:00 PM

**To:** Marten, Alex[Marten.Alex@epa.gov]; Shouse, Kate[Shouse.Kate@epa.gov]; McGartland, Al[McGartland.Al@epa.gov]; Beauvais, Joel[Beauvais.Joel@epa.gov]; Newbold, Steve[Newbold.Steve@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]; Wolverton, Ann[Wolverton.Ann@epa.gov]  
**From:** Kopits, Elizabeth  
**Sent:** Mon 7/13/2015 11:50:04 AM  
**Subject:** IER: OMB's Whitewash on the Social Cost of Carbon

<http://instituteforenergyresearch.org/analysis/ombs-whitewash-on-the-social-cost-of-carbon/>

Bob Murphy's latest post. It only focuses on discounting and consistency with A4, but notes at the end that "There are several other major problems, which the recent OMB document does not solve. We will report on these other issues in future posts."

**To:** Marten, Alex[Marten.Alex@epa.gov]; Shouse, Kate[Shouse.Kate@epa.gov]; McGartland, Al[McGartland.Al@epa.gov]; Beauvais, Joel[Beauvais.Joel@epa.gov]; Newbold, Steve[Newbold.Steve@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]; Wolverton, Ann[Wolverton.Ann@epa.gov]  
**From:** Kopits, Elizabeth  
**Sent:** Mon 7/13/2015 11:50:04 AM  
**Subject:** IER: OMB's Whitewash on the Social Cost of Carbon

<http://instituteforenergyresearch.org/analysis/ombs-whitewash-on-the-social-cost-of-carbon/>

Bob Murphy's latest post. It only focuses on discounting and consistency with A4, but notes at the end that "There are several other major problems, which the recent OMB document does not solve. We will report on these other issues in future posts."



**To:** Marten, Alex[Marten.Alex@epa.gov]  
**Cc:** Newbold, Steve[Newbold.Steve@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]; Wolverton, Ann[Wolverton.Ann@epa.gov]  
**From:** Kopits, Elizabeth  
**Sent:** Thur 7/2/2015 9:28:53 PM  
**Subject:** Re: FYI SCC blog post is live

Yes good plan.

Sent from my iPhone

On Jul 2, 2015, at 5:28 PM, "Marten, Alex" <Marten.Alex@epa.gov> wrote:

I tried to submit the erratum. The email address on the Climate Policy emails we received last year kept rejecting my messages so I sent it to another general inbox on the website. If I don't hear back by mid next week I will ping the copy editor and ask who I should be emailing. Make sense?

--

Alex L. Marten  
phone: (202) 566-2301  
email: [marten.alex@epa.gov](mailto:marten.alex@epa.gov)

**From:** Kopits, Elizabeth  
**Sent:** Thursday, July 02, 2015 5:26 PM  
**To:** Newbold, Steve; Griffiths, Charles; Wolverton, Ann  
**Cc:** Marten, Alex  
**Subject:** Fwd: FYI SCC blog post is live

Looping in the full team.

Have a great weekend everyone!

Also Alex sorry I haven't been able to look at the erratum but I am sure it is perfect. Thanks for doing it.

Best,

Elizabeth

Sent from my iPhone

Begin forwarded message:

**From:** "Marten, Alex" <[Marten.Alex@epa.gov](mailto:Marten.Alex@epa.gov)>

**Date:** July 2, 2015 at 5:18:06 PM EDT

**To:** "Kopits, Elizabeth" <[Kopits.Elizabeth@epa.gov](mailto:Kopits.Elizabeth@epa.gov)>, "McGartland, Al" <[McGartland.Al@epa.gov](mailto:McGartland.Al@epa.gov)>, "Beauvais, Joel" <[Beauvais.Joel@epa.gov](mailto:Beauvais.Joel@epa.gov)>, "Shouse, Kate" <[Shouse.Kate@epa.gov](mailto:Shouse.Kate@epa.gov)>, "Fawcett, Allen" <[Fawcett.Allen@epa.gov](mailto:Fawcett.Allen@epa.gov)>

**Subject:** FYI SCC blog post is live

<https://www.whitehouse.gov/blog/2015/07/02/estimating-benefits-carbon-dioxide-emissions-reductions>

--

Alex L. Marten

phone: (202) 566-2301

email: [marten.alex@epa.gov](mailto:marten.alex@epa.gov)

**To:** Marten, Alex[Marten.Alex@epa.gov]; Newbold, Steve[Newbold.Steve@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]; Wolverton, Ann[Wolverton.Ann@epa.gov]  
**From:** Kopits, Elizabeth  
**Sent:** Thur 6/11/2015 1:50:48 PM  
**Subject:** RE: papers listing omitted damages in IAMs

Also, from Polasky's testimony for MN case:

Van den Bergh and Botzen analyze estimates of the SCC from many sources and determine that important omitted categories of damages include large biodiversity losses, impacts on long-term economic growth, increased political instability, increased migration, extreme weather events, and irreversible climate change.

Van den Bergh, J.C.J.M & W.J.W Botzen, 2014. A lower bound to the social cost of CO<sub>2</sub> emissions. *Nature Climate Change*, 4, 253-58.

**From:** Kopits, Elizabeth  
**Sent:** Thursday, June 11, 2015 9:03 AM  
**To:** Marten, Alex; Newbold, Steve; Griffiths, Charles; Wolverton, Ann  
**Subject:** RE: papers listing omitted damages in IAMs

How about this?

Warren et al. 2006. "Spotlight Impact Functions in Integrated Assessment." Tyndall Center for Climate Change Research, Working Paper 91.

[http://www.researchgate.net/profile/Richard\\_Tol2/publication/221678858\\_Spotlighting\\_Impacts\\_Functions\\_in\\_](http://www.researchgate.net/profile/Richard_Tol2/publication/221678858_Spotlighting_Impacts_Functions_in_)

**From:** Marten, Alex  
**Sent:** Thursday, June 11, 2015 8:41 AM  
**To:** Newbold, Steve; Griffiths, Charles; Wolverton, Ann  
**Cc:** Kopits, Elizabeth  
**Subject:** papers listing omitted damages in IAMs

Hi All,

Can you think of any papers where they have explicitly listed omitted damage categories in a given IAM(s)? Particularly where they are trying to be compregensive.

--

Alex L. Marten  
phone: (202) 566-2301  
email: marten.alex@epa.gov

**To:** Marten, Alex[Marten.Alex@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; Wolverton, Ann[Wolverton.Ann@epa.gov]; Newbold, Steve[Newbold.Steve@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]  
**From:** McGartland, Al  
**Sent:** Tue 5/26/2015 3:20:03 PM  
**Subject:** FW: follow-up  
EPIC Cost of Carbon Final.pdf

-----Original Message-----

From: Michael Greenstone [mailto:mgreenst@mit.edu]  
Sent: Sunday, May 10, 2015 10:11 PM  
To: McGartland, Al  
Subject: follow-up

Hi Al,

Very nice to see you on Saturday morning.

I've attached the project that I'm working on to develop new and more reliable damage functions. If you know of offices at EPA or people in other places that might be interested in supporting this work, please let me know.

Also, I would appreciate any help you can provide on the project to experimentally evaluate environmental policy.

michael

Ex 5

**To:** Griffiths, Charles[Griffiths.Charles@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]; Newbold, Steve[Newbold.Steve@epa.gov]; Wolverton, Ann[Wolverton.Ann@epa.gov]  
**From:** Heninger, Brian  
**Sent:** Tue 1/6/2015 5:41:59 PM  
**Subject:** SCC on NPR Marketplace last night  
[mp\\_20150105\\_seg\\_17\\_64.mp3](#)

**SCC Folks,**

**This was an interesting piece I heard last night on the way home.**

<http://www.marketplace.org/topics/business/are-low-oil-prices-opening-carbon-tax>

**The MP3 is longer than the abbreviated text which comes up.**

**The story is motivated by Larry Summers article in the Post.**

[http://www.washingtonpost.com/opinions/oils-swoon-creates-the-opening-for-a-carbon-tax/2015/01/04/3db11a3a-928a-11e4-ba53-a477d66580ed\\_story.html](http://www.washingtonpost.com/opinions/oils-swoon-creates-the-opening-for-a-carbon-tax/2015/01/04/3db11a3a-928a-11e4-ba53-a477d66580ed_story.html)

-Brian

**From:** Griffiths, Charles  
**Location:** charles' office  
**Importance:** Normal  
**Subject:** Accepted: discuss FS SCC question  
**Start Date/Time:** Thur 7/16/2015 3:00:00 PM  
**End Date/Time:** Thur 7/16/2015 3:30:00 PM

**From:** Griffiths, Charles  
**Location:** charles' office?  
**Importance:** Normal  
**Subject:** Accepted: scc check in - file organization  
**Start Date/Time:** Tue 7/7/2015 3:30:00 PM  
**End Date/Time:** Tue 7/7/2015 4:00:00 PM

My office is fine



**To:** Marten, Alex[Marten.Alex@epa.gov]; Newbold, Steve[Newbold.Steve@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]  
**Bcc:** griffiths.charles.epa@gmail.com[griffiths.charles.epa@gmail.com]  
**From:** Griffiths, Charles  
**Sent:** Wed 5/20/2015 3:49:52 PM  
**Subject:** I scheduled 4424G for the Social Cost of Carbon Uncertainty/Reliability Meeting at 1:30

**To:** Marten, Alex[Marten.Alex@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]; McGartland, Al[McGartland.Al@epa.gov]; Newbold, Steve[Newbold.Steve@epa.gov]  
**From:** Wolverton, Ann  
**Sent:** Tue 5/26/2015 1:48:48 PM  
**Subject:** Results of the survey on social discounting  
[Drupp Freeman Groom Nesje2015 Discounting Disentangled Summary.pdf](#)  
[Drupp Freeman Groom Nesje2015 Discounting Disentangled Working Paper 172.pdf](#)

Thought you'd find this interesting.

Ann

**To:** McGartland, Al[McGartland.Al@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]; Wolverton, Ann[Wolverton.Ann@epa.gov]  
**From:** Kopits, Elizabeth  
**Sent:** Fri 1/23/2015 3:28:47 PM  
**Subject:** Final REEP and Science discounting papers by Arrow et al.  
[Rev Environ Econ Policy-2014-Arrow-145-63.pdf](#)  
[Science-2013-Arrow-349-50.pdf](#)

>  
>

**From:** Heninger, Brian  
**Location:** TBD  
**Importance:** Normal  
**Subject:** Canceled: SCC Weekly Check-in with Abt  
**Start Date/Time:** Tue 1/27/2015 3:00:00 PM  
**End Date/Time:** Tue 1/27/2015 3:30:00 PM

**From:** Kime, Robin  
**Location:** DCRoomARN3500/OPEI  
**Importance:** Normal  
**Subject:** SCC Draft Charge  
**Start Date/Time:** Tue 1/6/2015 6:00:00 PM  
**End Date/Time:** Tue 1/6/2015 6:30:00 PM

**From:** Marten, Alex  
**Location:** charles' office  
**Importance:** Normal  
**Subject:** Accepted: discuss FS SCC question  
**Start Date/Time:** Thur 7/16/2015 3:00:00 PM  
**End Date/Time:** Thur 7/16/2015 3:30:00 PM

**From:** Newbold, Steve  
**Location:** charles' office?  
**Importance:** Normal  
**Subject:** Accepted: scc check in - file organization  
**Start Date/Time:** Tue 7/7/2015 3:30:00 PM  
**End Date/Time:** Tue 7/7/2015 4:00:00 PM

**From:** Hodson, Elke  
**Importance:** Normal  
**Subject:** Accepted: check-in call on SCC  
**Start Date/Time:** Mon 5/11/2015 5:30:00 PM  
**End Date/Time:** Mon 5/11/2015 6:00:00 PM



**From:** Gillingham, Ken  
**Location:** Ken will send out conference line  
**Importance:** Normal  
**Subject:** NAS SCC kick-off  
**Start Date/Time:** Wed 7/22/2015 6:30:00 PM  
**End Date/Time:** Wed 7/22/2015 7:00:00 PM

;

**To:** Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]  
**From:** Newbold, Steve  
**Sent:** Tue 7/14/2015 6:53:32 PM  
**Subject:** Automatic reply: FYI - BloombergView post on SCC - by Cass

Hello,

I will be out of the office starting Monday July 13, returning Monday July 20. I will catch up on emails when I return to the office.

Thank you,

\*\*\*\*\*

Steve Newbold

U.S. EPA

National Center for Environmental Economics (NCEE)

EPA West, 4316T, MC 1809T

1200 Pennsylvania Ave NW

Washington, DC 20004

(202) 566-2293

\*\*\*\*\*

**From:** Shouse, Kate  
**Location:** DCRoomWJCS4228AOAP/DC-OAR-OAP  
**Importance:** Normal  
**Subject:** SCC  
**Start Date/Time:** Tue 7/14/2015 2:30:00 PM  
**End Date/Time:** Tue 7/14/2015 3:00:00 PM

**From:** Kopits, Elizabeth  
**Importance:** Normal  
**Subject:** Give DOI seminar on SCC (12pm???)  
**Start Date/Time:** Mon 3/14/2016 3:00:00 PM  
**End Date/Time:** Mon 3/14/2016 6:00:00 PM

See emails from Malka Pattison

**To:** Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]  
**From:** Durham, Natalie  
**Sent:** Wed 7/15/2015 8:02:44 PM  
**Subject:** RE: Scheduling SCC check in meeting with AI?

I will need to check with AI before scheduling the meeting. AI is still in a meeting. Would you need a call in number?

**From:** Kopits, Elizabeth  
**Sent:** Wednesday, July 15, 2015 3:38 PM  
**To:** Durham, Natalie  
**Subject:** RE: Scheduling SCC check in meeting with AI?

Yes. Thanks

**From:** Durham, Natalie  
**Sent:** Wednesday, July 15, 2015 3:29 PM  
**To:** Kopits, Elizabeth  
**Subject:** RE: Scheduling SCC check in meeting with AI?

Ann W?

**Natalie Durham**

**Environmental Protection Agency**

**National Center for Environmental Economics**

**1200 Pennsylvania Avenue NW**

Washington, DC 20460

202-566-2289

[Durham.natalie@epa.gov](mailto:Durham.natalie@epa.gov)

**From:** Kopits, Elizabeth

**Sent:** Wednesday, July 15, 2015 2:09 PM

**To:** Durham, Natalie

**Subject:** Scheduling SCC check in meeting with Al?

Hi Natalie,

Can you schedule a ~45min SCC Team check in meeting with Al? The following folks should be included: Al, me, Alex, Steve, Charles, and Ann.

Monday the 27<sup>th</sup> (10-12 looks free) would be best for me, but looks like Wednesday the 22<sup>nd</sup> (12-2pm looks free) or Thursday the 23<sup>rd</sup> (2-3pm) could work for everyone too.

Thanks!

Elizabeth

**To:** Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]  
**Cc:** Marten, Alex[Marten.Alex@epa.gov]  
**From:** Shouse, Kate  
**Sent:** Mon 6/29/2015 5:16:25 PM  
**Subject:** RE: scc comment citing 1981 court decision  
OMB NODA Rubber Manufacturers 0131.pdf

Yes – see attached

**From:** Kopits, Elizabeth  
**Sent:** Monday, June 29, 2015 1:14 PM  
**To:** Shouse, Kate  
**Cc:** Marten, Alex  
**Subject:** scc comment citing 1981 court decision

I think it is from the Rubber Manufacturers Assoc. (comment #131). Kate –do you happen to have this one? If not, I am downloading it from regulations.gov now.

**To:** Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]  
**From:** Groom,B  
**Sent:** Thur 5/28/2015 10:40:33 PM  
**Subject:** Results of Discounting Survey  
[Drupp Freeman Groom and Nesje 2015 Summary.pdf](#)  
[Drupp Freeman Groom Nesje2015 Discounting Disentangled Working Paper 172.pdf](#)

Dear Elizabeth,

I hope you are well. It seems like a long time since we met at the OECD meeting in Paris, but in the interim, as you know, my co-authors and I have been running a survey of experts on social discounting. We are now sending out the results to all the experts in our sampling frame in the hope that they will find them interesting and useful. Comments are also welcome. So attached you will find a two-page summary of the main results from the survey as well as the full working paper. I hope you find them interesting! Do let us know. All the best, Ben.

Now follows the patter that we have sent to all respondents to the survey:

The results point towards key deviations from standard policy guidance. In particular, only a minority of our respondents recommends a social discount rate (SDR) in line with the prominent Ramsey Rule, as often used in governmental guidelines. The qualitative responses we received suggest that we need more comprehensive approaches to discounting and intergenerational decision-making, addressing issues such as uncertainty, heterogeneity, relative prices, and alternative ethical approaches. We further find that:

- There is considerable disagreement among the respondents over the appropriate SDR, with point recommendations ranging from 0% to 10%. Yet we also find that 92% are comfortable with recommending SDRs somewhere in the interval of 1% to 3%.
- The mean (median) SDR response of 2.25% (2%) is substantially lower than the 4% (3%) reported in Weitzman's (2001) seminal "Gamma Discounting" survey. Yet the mode of 2% is the same.
- The mean (median) [mode] response for the rate of societal pure time preference is 1.1% (0.5%) [0%]. We thus cannot confirm the IPCC's (2014: 229) conclusion that "a broad consensus for a zero or near-zero pure rate of time preference" exists among experts.

We hope that the results are of interest to you and we would be very grateful for any feedback you might have. In particular, we would be very interested in additional explanations you might have with regards to your survey responses, such as rationales for the specific values of the SDR and the rate of pure time preference. Furthermore, we would be curious about your view on the appropriateness of the simple Ramsey Rule for



determining the SDR.

Many thanks again for your time and contribution!

Ben

together with Mark Freeman, Moritz Drupp and Frikk Nesje.

Ben Groom

LSE

**To:** Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]  
**From:** Groom,B  
**Sent:** Tue 5/26/2015 9:30:44 AM  
**Subject:** Results of the survey on social discounting  
[Drupp\\_Freeman\\_Groom\\_Nesje2015\\_Discounting\\_Disentangled\\_Summary.pdf](#)  
[Drupp\\_Freeman\\_Groom\\_Nesje2015\\_Discounting\\_Disentangled\\_Working\\_Paper\\_172.pdf](#)

Dear Elizabeth,

Last year you very generously participated in our survey on the determinants of long-term social discounting. We would like to express our deepest gratitude to you for contributing your time and thoughts to this work.

Kindly find enclosed a two-page summary of the main results from the survey as well as the full working paper.

The results point towards key deviations from standard policy guidance. In particular, only a minority of our respondents recommends a social discount rate (SDR) in line with the prominent Ramsey Rule, as often used in governmental guidelines. The qualitative responses we received suggest that we need more comprehensive approaches to discounting and intergenerational decision-making, addressing issues such as uncertainty, heterogeneity, relative prices, and alternative ethical approaches. We further find that:

- There is considerable disagreement among the respondents over the appropriate SDR, with point recommendations ranging from 0% to 10%. Yet we also find that 92% are comfortable with recommending SDRs somewhere in the interval of 1% to 3%.
- The mean (median) SDR response of 2.25% (2%) is substantially lower than the 4% (3%) reported in Weitzman's (2001) seminal "Gamma Discounting" survey. Yet the mode of 2% is the same.
- The mean (median) [mode] response for the rate of societal pure time preference is 1.1% (0.5%) [0%]. We thus cannot confirm the IPCC's (2014: 229) conclusion that "a broad consensus for a zero or near-zero pure rate of time preference" exists among experts.

We hope that the results are of interest to you and we would be very grateful for any feedback you might have. In particular, we would be very interested in additional explanations you might have with regards to your survey responses, such as rationales for the specific values of the SDR and the rate of pure time preference. Furthermore, we would be curious about your view on the appropriateness of the simple Ramsey Rule for determining the SDR.

Many thanks again for your time and contribution!

All the best

Ben Groom (LSE), Moritz Drupp (Kiel, LSE),  
Frikke Nesje (Oslo, LSE), Mark Freeman (Loughborough)

----

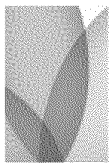
Dr Ben Groom

Associate Professor in Environment and Development Economics  
Director of the MSC in Environmental Economics and Climate Change

Department of Geography and Environment  
London School of Economics and Political Science  
Houghton Street  
London  
WC2A 2AE  
Email: [b.groom@lse.ac.uk](mailto:b.groom@lse.ac.uk)  
Tel: +44 (0)20 7852 3778

**To:** Newbold, Steve[Newbold.Steve@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]  
**From:** Kopits, Elizabeth  
**Sent:** Mon 6/29/2015 12:07:52 PM  
**Subject:** FYI - Traeger 2014  
[Traeger2014.pdf](#)

Just ran across this. You probably already know of it, but in case not...



# The Fertilizer Institute

Nourish, Replenish, Grow

February 26, 2014

**VIA ELECTRONIC DELIVERY**

Office of Information and Regulatory Affairs  
Office of Management and Budget  
Attn: Mabel Echols  
NEOB, Room 10202  
725 17th Street N.W.  
Washington, D.C. 20503  
[SCC@omb.gov](mailto:SCC@omb.gov)

**Re: TFI Comments on Technical Support Document: *Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis under Executive Order No. 12866*. Docket ID OMB-2013-0007**

Dear Ms. Echols:

The Fertilizer Institute (TFI), on behalf of its member companies, submits these comments in response to the Office of Management and Budget's (OMB) technical support document (TSD) entitled *Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order No. 12866* (hereafter "SCC Estimates"). The document was published in the Federal Register on November 26, 2013<sup>1</sup>. TFI also has joined, and adopts by reference herein, the comments submitted by the American Chemistry Council, National Association of Manufacturers, and multiple other organizations (ACC, et al.) concerned about the SCC Estimates. TFI provides these additional comments separately to raise additional points, as well as to expand on certain points of ACC, et al.

***STATEMENT OF INTEREST***

The Fertilizer Institute (TFI) represents the nation's fertilizer industry including producers, importers, retailers, wholesalers and companies that provide services to the fertilizer industry. TFI members provide nutrients that nourish the nation's crops, helping to ensure a stable and reliable food supply. TFI's full-time staff, based in Washington, D.C., serves its members through legislative, educational, technical, economic information and public communication programs.

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<sup>1</sup> 78 FR 70586.

TFI member companies may be impacted by the adoption and application of SCC Estimates in rules and other policy decisions because, in the course of their business, they emit greenhouse gas (GHG) emissions (including carbon dioxide (CO<sub>2</sub>)), and because many of them manufacture products that, when used, result in GHG emissions. TFI member companies also purchase equipment, products (e.g., electricity), and feed stocks (e.g., natural gas), the prices of which may increase significantly from rules and policies based on SCC Estimates, resulting in increased capital and operations & maintenance costs to operate facilities. TFI member companies compete in a global marketplace that is not constrained by consideration of SCC Estimates. The use of SCC estimates in regulations of GHG emissions can be reasonably anticipated to directly impact members' business operations. For example the DOE's current regulatory agenda notes a forthcoming proposal entitled "*Energy Conservation Standards for Commercial and Industrial Pumps*". TFI members operations require the use of industrial pumps and efficiency standards for this equipment that ascribe large benefits (beyond the actual energy savings) for incremental avoided carbon are virtually certain to increase the cost of this equipment and, in turn, TFI members' costs of operations. For all of the reasons outlined above, our members, therefore, have a direct interest in ensuring that any SCC Estimates are based on transparent processes, accurate information, rational assumptions, and within the reach of current scientific understanding.

### **GENERAL COMMENTS**

In the *Federal Register* notice, OMB "requests comments on all aspects of the TSD...and its use of integrated assessment models (IAMs) to estimate SCC values to support agency regulatory impact analyses."

First, OMB's request for comment has skipped a pivotal step by not meeting the procedural and substantive requirements of the Administrative Procedures Act (APA). OMB has not provided the legal authority or regulatory basis under which it is proposing the adoption of SCC Estimates in this rule and all other future rulemakings.

Moreover, even if OMB did have authority to adopt the SCC Estimates, TFI has determined that IWG's estimates of the social cost of carbon, based on complex economic impacts hundreds of years in the future and present-day understanding of current and future carbon emissions, do not offer a reasonably acceptable range of accuracy for use in policy-making.

The new SCC Estimates for 2020 in 2007 dollars were \$12, \$43, \$65, and \$129 for the 5%, 3%, 2.5% and 95<sup>th</sup> percentile of the 3% discount rates, respectively. These figures compare to the SCC values \$7, \$26, \$42, and \$81 in the 2010 TSD. At the 3% discount rate, the new SCC is approximately 65% higher than the 2010 value. In 2009, the IWG estimated a central value of \$19, and, in 2008, the U.S. Department of Transportation ("DOT") estimated a central value of \$7. Thus, in a span of five years, the central SCC value used in regulation has changed multiple times and increased by about 6-fold. The size and frequency of the changes to its SCC Estimates discredit the accuracy of the IWG's most recent estimate and the process and models through which the estimates were generated.

In addition, with respect to the IAM-specific questions posed by OMB, TFI finds that the SCC Estimates suffer from numerous technical deficiencies. The SCC Estimates fail to comply with OMB Circular A-4 and OMB guidance for developing influential policy-relevant information under the Information Quality Act (IQA). Neither the models themselves, nor the model assumptions used for the SCC Estimates were subject to peer review as appropriate and significant additional analysis is required as outlined below. The IWG failed to disclose and quantify key uncertainties to inform decision makers and the public about the effects and uncertainties of alternative regulatory actions.

As discussed more fully below, the current SCC Estimates engender specific biases into regulatory analyses. For example, by incorporating global SCC estimates and ignoring domestic SCC estimates, the IWG has limited the utility of the SCC for use in benefit cost analysis and domestic policy-making. The current SCC Estimates also bias regulatory analyses toward transfer of U.S. resources and corresponding benefits to foreign countries, foreign companies and foreign workers. The current SCC Estimates also attempt to assess costs over a timeline that is inconsistent with the evaluation of other (non-SCC) costs and benefits and inconsistent with the atmospheric lifetime of carbon dioxide. Bias is also introduced in the form of the use of assumptions that are inconsistent with OMB Circular A-4 and ascribe greater weight to highly uncertain benefits from the distant future as compared to highly certain near-term regulatory costs. Finally, the SCC Estimates also fail to include an effective discount to represent carbon leakage that is certain to accompany their application to all federal rulemakings. Further, the SCC Estimates fail in terms of process and transparency and compliance with the Regulatory Right to Know Act. OMB has not provided any of the information necessary to thoroughly evaluate the SCC Estimates. OMB also has not explained the process for consideration of the comments submitted in this docket.

Even if OMB had the authority necessary to promulgate this rule and even if OMB had complied with the procedural requirements associated with any such rule, the TSD is marred by significant substantive and technical shortcomings so serious that they render it arbitrary and capricious under the APA. These substantive defects include the following:

- OMB has failed to comply with current law that requires independent, external peer review of the apparent revisions that it has made to OMB Circular A-4 and gain Congressional approval for its 2010 recommendation for reform with respect to the SCC estimate;
- OMB has failed to subject its SCC estimate to independent, external peer review required to comply with OMB's requirements under the Information Quality Act (IQA) and OMB's own peer review bulletin;
- OMB has failed to make the TSD consistent with OMB Circular A-4. By substantially changing the scope of regulatory analysis for one potential externality, the TSD by itself fundamentally distorts Circular A-4 requirements; and

- OMB has displayed systemic bias by overstating the regulatory benefits reflected in the TSD. In this regard, numerous federal actions affect the direct or indirect carbon dioxide emission across the globe and other non-carbon dioxide global externalities. OMB has not explained why it is singling out regulatory actions for special treatment relative to public works projects or other actions that have similar implications for carbon dioxide emissions.

OMB should reassert itself here as a neutral arbiter that simply commends consistency in methodological practices associated with benefit-cost analysis (as opposed to imposing outcome-oriented, substantive policy determinations that serve to dictate levels at which sister agencies are meant to regulate).

For these reasons and those developed more fully below, we request that OMB withdraw the TSD and direct that it not be used in support of any further agency actions or proceedings.

## ***DETAILED COMMENTS***

### **I. THE SCC ESTIMATES VIOLATE THE ADMINISTRATIVE PROCEDURE ACT**

The OMB's SCC estimates are intended for use by all federal agencies evaluating the costs and benefits of proposed actions related to carbon emissions. As a result, they will influence agency decision-making, OMB scrutiny of those decisions, and the obligations imposed upon regulated entities. Because OMB's purported promulgation of estimates for the SCC through this TSD proceeding would (assuming it were a valid exercise of OMB authority) fall within the APA's broad definition of a "rule," OMB at the very least must comply with the procedural requirements of the APA before arriving at any such pronouncement. For the reasons stated herein, however, OMB lacks underlying authority to promulgate any such rule. Moreover, OMB has failed to satisfy the procedural requirements of the APA. Finally, the adoption of these SCC values would, in substance be, arbitrary, capricious, and contrary to law because they are contrary to OMB's statutory authority and because the TSD is substantively flawed. Therefore, we request that OMB withdraw the TSD and direct that it not be used in support of any further agency actions or proceedings.

We note at the outset that OMB cannot identify the authority for its rulemaking because none exists. No statute provides OMB or OIRA the authority to impose on federal agencies the SCC estimates in the TSD. Thus, OMB's exercise of regulatory discretion without explicit direction from Congress raises serious constitutional concerns, including concerns about breaching the separation of powers between the legislative and executive branches and violating the non-delegation doctrine. An executive agency cannot exercise rulemaking authority absent a delegation of authority from the legislature and an "intelligible principle" derived by statute to define the "boundaries of this delegated authority." *Mistretta v. United States*, 488 U.S. 361, 372-73 (1989). Nor may the President, through OMB, claim for himself the substantive policy determinations that Congress has entrusted by statute to independent agencies. *See* 1 Op. Att'y



Gen. 624, 625 (1823); *Gonzales v. Oregon*, 546 U.S. 243, 266-67 (2006) (“The structure of the CSA, then, conveys unwillingness to cede medical judgments to an executive official who lacks medical expertise. In interpreting statutes that divide authority, the Court has recognized: Because historical familiarity and policymaking expertise account in the first instance for the presumption that Congress delegates interpretive lawmaking power to the agency rather than to the reviewing court, we presume here that Congress intended to invest interpretive power in the administrative actor in the best position to develop these attributes. This presumption works against a conclusion that the Attorney General has authority to make quintessentially medical judgments.”) (Internal quotations omitted). Here, OMB is pronouncing upon a matter—i.e., the social costs of carbon—for which it lacks substantive authority and expertise and that fall within the domain of agencies such as DoE and EPA to assess consistent with their own respective substantive expertise.

As a result, the TSD is “not in accordance with law” within the meaning of the APA for the fundamental reason that OMB lacks legal authority to promulgate this rule. A federal agency is “a creature of statute,” and has “only those authorities conferred upon it by Congress.” *Michigan v. EPA*, 268 F.3d 1075, 1081 (D.C. Cir. 2001). “It is axiomatic that an administrative agency’s power to promulgate legislative regulations is limited to the authority delegated by Congress,” *Bowen v. Georgetown Univ. Hosp.*, 488 U.S. 204, 208 (1988), and, “if there is no statute conferring authority, a federal agency has none,” *Michigan*, 268 F.3d at 1081. Yet nowhere in the TSD or the Federal Register notice does OMB identify the statutory or regulatory basis for its asserted authority to prescribe a uniform SCC valuation governing the decision-making of other federal agencies. In sum, OMB is arriving at the TSD without requisite statutory authorization and in derogation of the U.S. Constitution.

Assuming, *arguendo*, that OMB somehow has authority to promulgate the TSD, the TSD would necessarily constitute a “rule” that must satisfy procedural as well as substantive requirements of the APA. The APA defines a “rule” in relevant part as “an agency statement of general or particular applicability and future effect designed to implement, interpret, or prescribe law or policy,” including “the approval or prescription of . . . valuations, costs, or accounting.” 5 U.S.C. § 551(4). This broad definition includes “virtually every statement an agency can make.” *Avoyelles Sportsmen’s League, Inc. v. Marsh*, 715 F.2d 897 (5th Cir. 1983). When promulgating a substantive rule, an agency must comply with the procedural requirements of the APA, including by providing, in advance, public notice of proposed rulemaking, an opportunity for public comment, and a description in the rule of its basis and purpose. 5 U.S.C. § 553; *See U.S. Dep’t of Labor v. Kast Metals Corp.*, 744 F.2d 1145, 1152 (5th Cir. 1984) (noting exception for certain non-substantive rules). Agency rules are subject to judicial review and may be set aside if they are “arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law.” 5 U.S.C. § 706(2)(A).

Promulgation of the SCC estimates by OMB would, if otherwise authorized and valid, constitute a substantive rule under the APA. The SCC estimates addressed in this TSD are designed to implement federal policy for how carbon costs are to be evaluated in future agency proceedings and these estimates, once finalized, are to be applied across the federal government as a common cost valuation for carbon. *See* 78 Fed. Reg. at 70,586 (OMB will “ensure that agencies are appropriately measuring the social cost of carbon emissions as they evaluate the costs and

benefits of rules.”); OIRA Letter at 3. Rather than interpret existing obligations or state tentative intentions for the future, the TSD imposes new *substantive* burdens on federal agencies regarding their analysis of the costs and benefits of carbon emissions in agency decision-making, and thus on regulated parties that are subject to resulting regulation. Reflecting the purpose of this proceeding, OMB now seeks “public comment on the SCC through the formal rulemaking comment process that applies to all Federal rulemaking.” *Id.* Nothing in the TSD suggests that these estimates of the SCC provide only nonbinding “guidance,” and the TSD presents no discussion of the circumstances in which an agency might depart from this methodology in calculating the benefits of reducing carbon emissions.

Many federal programs require that agencies consider the direct and indirect costs of proposed actions when formulating agency rules and other regulatory requirements. In this regard, Executive Order 12866 requires that each agency “assess both the costs and the benefits of the intended regulation and,” to the extent permitted by law, “propose or adopt a regulation *only* upon a reasoned determination that the benefits of the intended regulation justify its costs.” (emphasis added). In some instances, specific statutory programs require an analysis of costs and benefits. For example, Congress requires the Department of Energy to adopt energy conservation standards that are “designed to achieve the maximum improvement in energy efficiency . . . which the Secretary determines is technologically feasible and economically justified.” 42 U.S.C. § 6295(o)(2)(A). To determine whether a standard is “economically justified,” the Secretary must determine “whether the benefits of the standard exceed its burdens.” *Id.* § 6295(o)(2)(B)(i). The SCC being developed by OMB is specifically intended to be applied by federal agencies in their analyses under E.O. 12866 and related regulatory decisions.

By adopting the SCC estimates, therefore, OMB is attempting (unlawfully) to “prescribe law or policy” by specifying “valuations, costs, or accounting” to govern federal agencies’ analyses of the costs and benefits of their regulatory actions. The SCC estimates in this TSD are intended to be used to constrain agency decision-making, thereby raising the constitutional concerns noted above about usurping substantive policy determinations that are statutorily reserved for other agencies. Setting those concerns aside, however, the stated purpose of the TSD is to affect agency regulatory actions. *See* 78 Fed. Reg. at 70,586 (OMB will “ensure that agencies are appropriately measuring the social cost of carbon emissions as they evaluate the costs and benefits of rules.”). Indeed, federal agencies have used SCC values to inform decision-making since at least 2008, *see* Appendix, and prior SCC estimates adopted by OMB without adhering to APA’s procedural requirements have already influenced agencies’ consideration of regulatory costs.<sup>2</sup> As such, OMB’s adoption of these SCC estimates is a substantive rule under the APA,

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<sup>2</sup> EPA has previously used the 2010 SCC estimates in cost-benefit analyses supporting Clean Air Act rules. *See, e.g.*, 77 Fed. Reg. 62,624 (Oct. 12, 2012) (light-duty vehicle CAFE standards); 77 Fed. Reg. 49,489 (Aug. 16, 2012) (NESHAPs for oil and gas source category); 77 Fed. Reg. 9304 (Feb. 16, 2012) (NESHAPs for power plant source category); 75 Fed. Reg. 25,324 (May 7, 2010) (tailpipe GHG/CAFE rules). Likewise, the Department of Energy has used the May 2013 SCC estimates in connection with a rulemaking addressing the energy efficiency standard for microwave ovens and to support a proposed energy efficiency rule for metal halide lamp fixtures. 78 Fed. Reg. 36,316 (June 17, 2013) (microwave ovens); 78 Fed. Reg. 51,464 (Aug. 20, 2013) (lamp fixtures). Moreover, the SCC estimates have been used by a non-governmental organization in arguments related to the Best Achievable Control Technology analysis in a greenhouse gas PSD permit application. ([Sierra Club Petition For Review Of](#)

and OMB in this proceeding must comply with the procedural and substantive requirements of the APA and other applicable law. *See Batterton v. Marshall*, 648 F.2d 694 (D.C. Cir. 1980) (agency selection of methodology for collecting unemployment statistics was “rule” requiring compliance with APA procedures).

While the APA requires notice and an opportunity for public comment *before* an agency takes action, OMB has solicited comment on the TSD *only after* its proposed estimates have been applied in several rulemakings. OMB’s after-the-fact approach to rulemaking is itself inconsistent with the APA, and failure to allow for a meaningful opportunity for comment in this proceeding will only compound those problems. Beyond these procedural concerns, the APA imposes substantive standards for agency action, through its direction that agency action be set aside if it is “arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law.” 5 U.S.C. § 706(2)(A). From a substantive standpoint, the TSD falls far short of the requirements of the APA and of other statutes and Executive Orders governing agency action.

## **II. THE SCC ESTIMATES ARE INCONSISTENT WITH THE REGULATORY RIGHT TO KNOW ACT AND OMB’S OWN OPEN GOVERNMENT INITIATIVE**

The history of the Administration’s consideration of potential SCC values raises substantial concerns over its compliance with the APA, the Regulatory Right to Know Act and with the Administration and OMB’s own pledges for transparency in scientific analysis. As the chart in the Attachment shows, starting in 2008 agencies began to adopt SCC values in regulatory and policy analyses.<sup>3</sup>

The Regulatory Right to Know Act requires OMB to prepare an annual report to Congress on the benefits and costs of federal regulations.<sup>4</sup> In addition, the law requires OMB to make recommendations for reform to Congress. OMB advocated to Congress for increased benefits from climate-related regulations by publishing in its 2010 Report to Congress a reform recommendation for the treatment of the social cost of carbon-related damages.<sup>5</sup> Although the

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Prevention Of Significant Deterioration Permit Issued By Region VI For Exxonmobil Chemical Company, Baytown Olefin Plant (EAB Appeal Number: PSD 13-11; PSD Permit No. PSD-TX-102982-GHG). December 26, 2013.)

<sup>3</sup> Prior rulemakings explicitly excluded the SCC; for example: “The agency continues to view the value of reducing emissions of carbon dioxide and other greenhouse gases as too uncertain to support their explicit valuation and inclusion among the savings in environmental externalities from reducing gasoline production and use. There is extremely wide variation in published estimates of damage costs from greenhouse gas emissions, costs for controlling or avoiding their emissions, and costs of sequestering emissions that do occur, the three major sources for developing estimates of economic benefits from reducing emissions of greenhouse gases. ... As a consequence, the agency has elected to include no economic value for reducing greenhouse gas emissions.” See FINAL REGULATORY IMPACT ANALYSIS, CORPORATE AVERAGE FUELECONOMY and CAFE REFORM FOR MY 2008-2011 LIGHT TRUCKS, March 2006 available at (<http://www.nhtsa.gov/fuel-economy>).

<sup>4</sup> Section 624 of the Treasury and General Government Appropriations Act of 2001, Pub. L. No. 106-554, 31 U.S.C. § 1105 note.

<sup>5</sup> See pages 42-43 of the *Draft 2010 Report to Congress on the Benefits and Costs of Federal Regulations and Unfunded Mandates on State, Local, and Tribal Entities*, Office of Management and Budget, April 13, 2010. See

2010 report described the social cost of carbon as a provisional value, OMB recommended its use in regulatory impact analyses.

In February 2012, the Department of Energy (DOE) published a notice of proposed rulemaking to set energy efficiency standards for microwave ovens that contained SCC values.<sup>6</sup> DOE then published the final rule in June 2013 but changed the SCC values to significantly higher levels.<sup>7</sup> This change was made without the public having the opportunity to comment on the new range of values and the underlying data and methodology. At this point, OMB's provisional values became the default values used to justify agency rulemaking.

The SCC and its derivation have substantial impact on the net benefits of rulemaking, on agency compliance with various laws that require benefit-cost analyses, and on the public understanding of the government policy. It is worthy, and arguably required under APA, of substantial public discussion and comment. However, prior to OMB's November 26<sup>th</sup> notice, the only opportunities to comment on the SCC estimates have been as part of other disparate rulemakings.

For example, OMB's documents claim that it considered public comments on its SCC values that may have been made to the Department of Transportation and the Environmental Protection Agency on the Passenger Car and Light Truck Corporate Average Fuel Economy Standards MYs 2012 to 2016 that was published September 28, 2009.<sup>8</sup> This complex proposal had only a 60-day comment period on a very long rule (over 300 pages of the Federal Register), with OMB's 2010 version of the TSD tucked away somewhere else.<sup>9</sup> Note that DOT had published a different SCC in its October 2008 federal environmental impact statement (FEIS), so the long and complex draft 2009 CAFE rule is the first inkling that the public would have had on the OMB's new approach and requirements.<sup>10</sup>

OMB's May and November 2013 "technical" updates contain no response to public commentary to the February 2010 TSD – possibly because there were few comments due to much of the public being unaware of these regulatory analysis requirements or because the public was confused about where it should send its commentary.

A lack of clarity and transparency extends to the participants in the interagency working group that authored the TSD. Prior to OMB's announcement, it was unclear which agency would

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also page 49 of the final *2010 Report to Congress on the Benefits and Costs of Federal Regulations and Unfunded Mandates on State, Local, and Tribal Entities*, Office of Management and Budget, July 2010.

<sup>6</sup> 77 FR 8555

<sup>7</sup> Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Residential Microwave Ovens – Stand-by Power. May 2013.

<http://www.regulations.gov/#!documentDetail;D=EERE-2011-BT-STD-0048-0021>

<sup>8</sup> 74 FR 49453. See also pages 49611 and 49612 of "Proposed Rulemaking To Establish Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards," Pages 49454 - 49789 [FR DOC # E9-22516] "We request comment on the approach used to estimate the set of SCC values used for this coordinated proposal as well as the other options considered. The estimates presented here are interim values. EPA and other agencies will continue to explore the underlying assumptions and issues."

<sup>9</sup> In EPA's docket numbered EPA-HQ-OAR-2009-0472 and DOT's docket numbered NHTSA-2009-0059.

<sup>10</sup> *Corporate Average Fuel Economy Standards Passenger Cars and Light Trucks Model Years 2017-2025. Final Environmental Impact Statement*, National Highway Traffic Safety Administration, July 2012

accept ownership and public comment. It is still unclear as to the expertise and level of deliberation of the working group members.

This less-than-straightforward and transparent approach to seeking public comment on the SCC is inconsistent with the Administration's stated goals for transparency in scientific information. On January 21, 2009, President Obama said, "my Administration is committed to creating an unprecedented level of openness in Government." At the President's direction OMB itself issued an Open Government Directive stating:

Transparency promotes accountability by providing the public with information about what the Government is doing. Participation allows members of the public to contribute ideas and expertise so that their government can make policies with the benefit of information that is widely dispersed in society. Collaboration improves the effectiveness of Government by encouraging partnerships and cooperation within the Federal Government, across levels of government, and between the Government and private institutions.<sup>11</sup>

By releasing the SCC as a final decision in a "technical support document," and incorporating it in a final rulemaking on microwave ovens without giving the public the opportunity for comment on the change, OMB disregarded its open government principles and undermined the President's commitment to open government. OMB is setting a poor example for other Federal agencies through its arbitrary and post-hoc solicitation of public comment.

Importantly, OMB bypassed independent, external peer review of its unilateral change to social discounting as required by the Regulatory Right to Know Act. OMB made a recommendation to Congress in an annual report and then proceeded without independent peer review and any affirmation from the Congress.

As mentioned above, the Regulatory Right to Know Act requires OMB to prepare an annual report to Congress on the benefits and costs of federal regulations. The statute also requires that OMB issue independent and external peer-reviewed guidelines to agencies to standardize measures of costs and benefits and the format of annual accounting statements. These guidelines were issued originally after independent and external peer review in September 2003 as Circular A-4, *Regulatory Analysis*.<sup>12</sup>

Among other best practices, the current Circular requires discount rates applied to future benefits and costs:

As a default position, OMB Circular A-94 states that ***a real discount rate of 7 percent should be used as a base-case for regulatory analysis***. The 7 percent rate is an estimate of the average before-tax rate of return to private capital in the U.S. economy. It is a broad measure that reflects the returns to real estate and small business capital as well as corporate capital. It approximates the opportunity cost of capital, and it is the appropriate

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<sup>11</sup>*Open Government Directive*, Office of Management and Budget, December 8, 2009.

<sup>12</sup>Office of Management and Budget, *Circular A-4 Regulatory Analysis*, September 17, 2003.

discount rate whenever the main effect of a regulation is to displace or alter the use of capital in the private sector. OMB revised Circular A-94 in 1992 after extensive internal review and public comment. In a recent analysis, OMB found that the average rate of return to capital remains near the 7 percent rate estimated in 1992. Circular A-94 also recommends using other discount rates to show the sensitivity of the estimates to the discount rate assumption.<sup>13</sup> (emphasis added)

Note that Circular A-4 allows other discount rates for sensitivity purposes, but requires that seven percent be applied in the agencies' base case analyses.<sup>14</sup>

OMB's SCC TSD uses a discount rate different and lower than the one published in Circular A-4. As discussed below, there are significant policy and methodological issues with valuing one potential benefit at a systematically higher value than other benefits and costs. However, at a minimum, OMB has failed to follow the procedures Congress required to change its economic analysis guidelines. OMB has a statutory requirement to provide for independent peer review any changes to Circular A-4. Thus far, OMB has not followed the law by applying three percent as the default rate for the integrated assessment models and the resulting SCC valuation.

### **III. THE SCC ESTIMATES DO NOT COMPLY WITH EITHER OMB'S OWN GUIDANCE UNDER THE INFORMATION QUALITY ACT OR OMB'S PEER REVIEW BULLETIN**

In 2004, OMB issued a government-wide bulletin to improve data quality under the 2001 Information Quality Act (IQA) in its Information Quality Bulletin for Peer Review (Bulletin).<sup>15</sup> The TSD meets OMB's criteria for "influential scientific information" under the Bulletin.<sup>16</sup> The Bulletin defines "influential" as "scientific information the agency reasonably can determine will have or does have a clear and substantial impact on important public policies or private sector decisions." Because it is influential information, OMB should follow its own IQA procedures for peer review before disseminating the SCC TSD. It has not.

OMB developed the IQA Guidelines to ensure that the information it disseminates meets standards for objectivity, utility, and integrity. OMB's IQA Guidelines require it to maximize the quality of disseminated information that it classifies as influential information that will have a clear and substantial impact on important public policies or important private sector decisions. The SCC Estimates clearly meet this criterion.

Under IQA Guidelines, such influential information must meet a higher level of transparency, such that findings are reproducible, within an acceptable range of imprecision, by third parties.

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<sup>13</sup> Ibid, pg. 33.

<sup>14</sup> Ibid, pg. 36, "If your rule will have important intergenerational benefits or costs you might consider a further sensitivity analysis using a lower but positive discount rate in addition to calculating net benefits using discount rates of 3 and 7 percent."

<sup>15</sup> Office of Management and Budget, *Information Quality Bulletin for Peer Review*. December 2004.

<sup>16</sup> 70 FR 2667. The term "influential scientific information" means scientific information the agency reasonably can determine will have or does have a clear and substantial impact on important public policies or private sector decisions.

Influential information must also be transparent with respect to: (1) the source of the utilized data; (2) the various assumptions employed; (3) the analytic methods applied; and (4) the statistical assumptions employed.<sup>17</sup>

The process of selecting the models and input assumptions, including much of the basic information underlying these decisions, has been kept from public scrutiny. The resulting SCC Estimates are a product of a flawed process that failed to comply with basic IQA requirements designed to enhance and ensure the credibility of data used to make critical regulatory decisions.

OMB, as the disseminator of the SCC Estimates, and the overseer of the IWG, has not met its duty in providing relevant information on the IWG estimation process. OMB has not revealed the identity of the IWG participants or information necessary to make an assessment as to their expertise or qualifications to estimate the SCC. OMB has not revealed whether, or how often, the IWG met, what was discussed, what information was considered, what information was rejected, or how decisions were made.

Further, OMB and the IWG has shielded the modeling systems, inputs, and resulting estimates from peer review, making review of the inherent flaws and limitations of the SCC Estimates impossible. Despite the fact that OMB's IQA Rule and Guidelines, as well as its Peer Review Bulletin, recognize the critical need for peer review in administrative decision-making, neither OMB nor the IWG subjected the final SCC Estimates, or their key foundations, to peer review, undermining the credibility of the SCC Estimates.

The fact that the IWG utilized models that generally may be available to the public does not sufficiently absolve the IWG selection process from peer-review. There is no evidence of how the IWG addressed the limitations of each of the selected models. The class of models known as IAMs are continuously changing and evolving and there is no evidence of their development for the purposes of application to domestic-only regulation. While such models attempt to predict the near and far future, they all rely on numerous assumptions – including many that are decades old, and others that simply cannot be calibrated or verified. Further, the sensitivity of inputs to model outcomes inputs in the FUND, DICE, and PAGE models is not transparent. Without any information as to the hundreds of model inputs and their sensitivities, it is impossible to call the SCC Estimates rational or supportable.

The SCC Estimates are not only the product of the models, but also of the data and/or policy choices inherent in the model input selection. For the three models used, OMB has not properly documented what the inputs are or how they were determined. Thus, it is not possible to critically review the deterministic inputs (*i.e.*, assumed values for those inputs held constant) or the stochastic inputs (*i.e.*, those inputs that were selected to be variable) that supported the Monte Carlo analysis. The inputs that drive the SCC estimates and the final estimates (*i.e.*, the products of these models and inputs) were never peer reviewed.

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<sup>17</sup> 67 Fed. Reg. 369, 374 (Jan. 3, 2002).

OMB expects numerous federal agencies to use its SCC value in rulemakings, which, due the new SCC, will increase and benefits estimates from those regulations.<sup>18</sup> In just one rulemaking, DOE's microwave standard, the SCC added over \$400 million in social benefits. As such, OMB's action itself is an economically significant policy instrument and a "highly influential" data under IQA. An assessment is highly influential if:

the agency or the OIRA Administrator determines that the dissemination could have a potential impact of more than \$500 million in any one year on either the public or private sector or that the dissemination is novel, controversial, or precedent-setting, or has significant interagency interest. One of the ways information can exert economic impact is through the costs or benefits of a regulation based on the disseminated information.<sup>19</sup>

Putting aside the novelty of a government-wide guidance on one type of social benefit, the DOE rule alone shows that the SCC TSD will have a potential impact of more than \$500 million.

The need for external peer review is even more compelling due to OMB use of its own unsubstantiated methodology in the TSD. Specifically, in the TSD OMB combined three separate integrated assessment models into a distinct methodology. Despite a stated need for more information<sup>20</sup> and the poorly understood relationship between emissions, climate change, and economic damages,<sup>21</sup> OMB relies on three IAMs (DICE 2010, PAGE09 and FUND 3.8) for calculating social cost of carbon values. OMB fails to clearly present the basic assumptions, methods and data underlying the analysis in each of these models. And, in describing the IAMs' peculiarities and rigidities, the 2010 report acknowledges:

***These differences underscore the need for a thorough review of damage functions***—in particular, how the models incorporate adaptation, technological change, and catastrophic damages. Gaps in the literature make modifying these aspects of the models challenging, which ***highlights the need for additional research***. (emphasis added)

The IAMs damage functions, which drive the estimates, are entirely speculative.<sup>22</sup> It is not at all clear which model OMB prefers and why it is preferable. Perhaps having no preference led OMB to give equal weight to these three peculiar models.<sup>23</sup> However, this choice of equal

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<sup>18</sup> See, for example, Dudley, Susan E., Miller, Sophie E., and Mannix, Brian F., "[Public Interest Comment on Reconsideration of the Department of Energy's Final Rule: Energy Conservation Standards for Standby Mode and Off Mode for Microwave Ovens](#)," September 6, 2013; and Dudley, Susan E., "[Seeking Comment on the Social Cost of Carbon](#)," Regulatory Studies Center, November 26, 2013.

<sup>19</sup> Ibid, pg. 23.

<sup>20</sup> See pages 2, 3, 4, and 8 of the [Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866](#), Interagency Working Group on Social Cost of Carbon, February 2010.

<sup>21</sup> "The relationship between climate impacts and damages are based on judgment, assumptions or analogy because data are lacking." ([National Research Council 2009](#))

<sup>22</sup> See Pindyck, Robert S., "[Pricing Carbon When We Don't Know the Right Price](#)," Regulation, Summer 2013; and, Tol, Richard S.J., "[The Marginal Damage Costs of Carbon Dioxide Emissions: An Assessment of the Uncertainties](#)," Pages 2064–2074, Energy Policy, Volume 33, Issue 16, November 2005.

<sup>23</sup> See Masur, Jonathan S. and Posner, Eric A., "[Climate Regulation and the Limits of Cost-Benefit Analysis](#)," August 19, 2010, California Law Review, Vol. 99, p. 1557, 2011, page 1583, "The models are crude and



weighting is a scientific judgment that should be subject to peer review under OMB guidelines.

In addition, the TSD asserts that the model estimates of SCC are precise enough to support two significant figures of precision. As Circular A-4 instructs, “Your estimates cannot be more precise than that of their most uncertain component. Thus, your analysis should report estimates in a way that reflects the degree of uncertainty and not create a false sense of precision.”<sup>24</sup> The average value using a three percent discount rate in 2015 is \$37, not \$36 or \$38. OMB apparently has made the judgment that the models support this level of precision. This judgment has significant policy implications and has not been subject to independent peer review.

Further, Federal agencies have used a range of SCC estimates in rulemakings and policy documents in recent years (see the appendix for recent regulatory actions that used the social cost of carbon in making benefits estimates). OMB’s recent revision reflects another approach. Even putting aside OMB’s obligations under its own peer review bulletin, conducting a comprehensive peer review of the various SCC estimates and methodologies would benefit the public’s understanding and confidence in these estimates.

OMB may assert that it has already complied with the peer review bulletin as it allows no further peer review on information that has already been subjected to *adequate* peer review. However, this assertion would be false. In determining whether prior peer review is adequate, OMB was required to give due consideration to the novelty and complexity of the science to be reviewed, the importance of the information to decision making, the extent of prior peer reviews, and the expected benefits and costs of additional review. The bulletin specifically states that principal findings, conclusions and recommendations in official reports of the National Academy of Sciences are generally presumed to have been adequately peer reviewed – but the National Academy of Sciences reviewed neither OMB’s SCC valuation nor the TSD. As stated in the bulletin:

Peer review should not be confused with public comment and other stakeholder processes. The selection of participants in a peer review is based on expertise, with due consideration of independence and conflict of interest. Furthermore, notice-and-comment procedures for agency rulemaking do not provide an adequate substitute for peer review, as some experts -- especially those most knowledgeable in a field -- may not file public comments with federal agencies.<sup>25</sup>

OMB may perhaps be laboring under the misimpression that if the integrated assessment models were peer reviewed, then their use of these multiple sources means that the social cost of carbon values also have been adequately reviewed. However, the bulletin also addresses this as follows:

Publication in a refereed scientific journal may mean that adequate peer review has been performed. However, the intensity of peer review is highly variable across journals.

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inconsistent. At the low levels of emission reductions relevant here, the DICE, FUND, and PAGE models produce highly divergent results. Recall that the models are probabilistic; they each produce a range of possible outcomes of varying probabilities.”

<sup>24</sup> Circular A-4, pg. 40.

<sup>25</sup> Ibid, pg. 4.

There will be cases in which an agency determines that a more rigorous or transparent review process is necessary. For instance, an agency may determine a particular journal review process did not address questions (e.g., the extent of uncertainty inherent in a finding) that the agency determines should be addressed before disseminating that information. As such, prior peer review and publication is not by itself sufficient grounds for determining that no further review is necessary.<sup>26</sup>

Because it is a highly influential scientific document, OMB's SCC valuation is subject to the highest standards under its own peer review bulletin under the IQA. Further, OMB combined three separate integrated assessment models into a distinct methodology in its guidance for the SCC to be used in regulatory review. OMB should comply with its own bulletin and President Obama's Scientific Integrity directive by submitting its technical support document for external and independent peer review.

#### **IV. EXAMPLES OF HOW THE SCC ESTIMATES BIAS REGULATORY ANALYSIS**

As the TSD states, "the purpose of the [SCC] estimates presented here is to allow agencies to incorporate the social benefits of reducing carbon dioxide ...emissions into cost-benefit analyses of regulatory actions that impact cumulative global emissions." In other words, OMB is giving a tool that: 1) applies to only social benefit estimate; 2) has a global analytic framework; and, 3) represents a time stream of potential benefits over many decades. The issue is that expanding regulatory analyses in these dimensions for one externality is inconsistent with OMB's Circular A-4 and thus would distort and bias regulatory analyses without conforming changes throughout Circular A-4. We note that these conforming changes would radically change the structure and scope of regulatory analyses requirements that has been ongoing for more than 30 years.

To expand the geographic and temporal scope for one potential externality -- carbon dioxide emissions -- and not do so for all other marginal damages from resource use and costs and benefits that flow from a rulemaking's market effects, would make this SCC requirement arbitrary and capricious. OMB should make the draft SCC memorandum consistent with Circular A-4 or, if it believes the SCC framework constitutes its preference for policy analysis, change all of the provisions of A-4 to be consistent with the SCC memorandum and justify those changes on legal, technical and policy grounds. There are several policy changes that must occur:

- **Geographic Baseline.** Circular A-4 states: "Your analysis should focus on benefits and costs that accrue to citizens and residents of the United States. Where you choose to evaluate a regulation that is likely to have effects beyond the borders of the United States, these effects should be reported separately." The TSD acknowledges this requirement but gives two reasons it finds carbon dioxide emissions call for a global approach: 1) U.S.-based emissions create a global externality; and, 2) "*climate change presents a problem that the United States alone cannot solve. Even if the United States were to*

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<sup>26</sup> Ibid, pg. 22.

*reduce its greenhouse gas emissions to zero, that step would be far from enough to avoid substantial climate change.”* (emphasis added)<sup>27</sup>

OMB and the IWG acknowledge that there is no carbon price high enough to use as an SCC estimate for domestic policy to eliminate or even substantially reduce the perceived externality. This acknowledgement undermines the Administration’s approach to incorporating the SCC Estimates into all domestic rulemakings.

Moreover, there are two other significant problems with OMB’s finding. First, there are many goods and services that meet the two characteristics OMB cites for carbon dioxide emissions. For example, global externalities can occur through depletion of global fisheries, increases in ozone depleting substances, increases in global emissions of mercury, as well as many other examples that meet OMB’s cited rationale. Expanding beyond environmental policy, U.S. regulation arguably also could reduce other global scourges, whether they are illegal drugs or human trafficking.

Second, if the benefits are calculated globally, social costs should be also so as not to bias the analytic results. If U.S. regulation increases foreign manufacturing or agriculture output, to be consistent, OMB should require agencies to estimate the loss in these localities’ ecological services, the regional adverse health effects of greater ozone and other air pollutant emission increases, and other externalities in these non-U.S. global regions.

The imbalance is particularly striking since many environmental regulations increase energy use and thus carbon dioxide emissions. Thermal treatment of volatile organic compounds, vehicle catalytic converters, nitrogen oxides abatement technologies, wastewater treatment, thermal treatment of contaminated soils and sediments are just a few examples. The Clean Air Act requires EPA to estimate the energy use of its regulations.<sup>28</sup> But OMB has not provided guidance to agencies that the SCC should be included when estimating the social costs of regulation. As OMB’s guidance currently stands, agencies must use a global value for carbon emission benefits (but not other benefits), though not for any social costs.

In addition, if regulations raise the cost of production and prices domestically, more economic activity will move out of the United States. Exporting energy and the means of production abroad will lower US carbon dioxide emissions in the US, but raise them as global competition moves the jobs, the production, and the emissions elsewhere, most likely to locales with less efficient production than the United States. OMB has not provided guidance to agencies on how to account for this “carbon leakage”. This carbon leakage could offset much of the estimated avoided emissions from the application of the SCC to regulation that applies only within the United States.

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<sup>27</sup> See page 10 of the Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866, Interagency Working Group on Social Cost of Carbon, February 2010.

<sup>28</sup> 42 USC 7617 (c)(5).

- **Transfer Payments.** Expanding the geographic analytic frame to worldwide effects would be inconsistent with the Circular A-4 requirement to include, as costs, any transfers from US consumers to foreign organizations. The current version of Circular A-4 states:

The net reduction in the total surplus (consumer plus producer) is a real cost to society, but the transfer from buyers to sellers resulting from a higher price is not a real cost since the net reduction automatically accounts for the transfer from buyers to sellers. However, transfers from the United States to other nations should be included as costs, and transfers from other nations to the United States as benefits, as long as the analysis is conducted from the United States perspective.<sup>29</sup>

If OMB adopts a global view, agencies will no longer be required to account for the transfer of US resources to foreign companies and workers.

The DOE microwave rule shows the difference in perspective. At the outset, we note DOE failed to comply with A-4 and estimate the transfer costs of US buyers to foreign producers. This transfer is significant. DOE's regulation increases the microwave oven prices, reducing consumer demand and overall consumer and producer surplus. In those cases, in response to higher prices, US consumers pay more. Most of that extra payment goes to the sellers. In the microwave oven market, those producers are virtually all foreign companies. Only 1.3 percent of microwaves bought in the US are made in the US according to DOE.<sup>30</sup> In 2009, the US microwave oven imports totaled \$876 million, 68 percent of that amount from China.<sup>31</sup> Using data in DOE's analysis, the rule appears to require a transfer of about \$60 million/year from US households to businesses in China and other countries. This transfer doubles the cost of DOE's rule.

By adopting a global frame, OMB's SCC requirement would be inconsistent with and effectively eliminate this basic analytic requirement. Policy officials and the public could then not see how Federal regulation shifts US wealth to other countries.

- **Temporal Baseline.** Circular A-4 states: "The time frame of your analysis should cover a period long enough to encompass all the important benefits and costs likely to result from the rule." By adopting the results of these three models, OMB is implicitly extending the time frame of analyses using its recommended values to hundreds of years in the future. The same issues apply to changing the temporal scope to changing the geographical one; if it requires this change for SCC, OMB should require it for all social benefits and for social costs as well.

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<sup>29</sup> Circular A-4, pg. 38.

<sup>30</sup> *TECHNICAL SUPPORT DOCUMENT: ENERGY EFFICIENCY PROGRAM FOR CONSUMER PRODUCTS AND COMMERCIAL AND INDUSTRIAL EQUIPMENT: RESIDENTIAL MICROWAVE OVENS – STAND-BY POWER*, US Department of Energy, May 2013.

<sup>31</sup> See <http://worldtradedaily.com/2012/07/13/microwave-ovens-trade-profile-u-s-importing-companies-and-free-data-download/>

There is a growing literature that finds significant association between parental job loss and unemployment with adverse health and welfare effects on their families and children. These adverse effects include increased hospitalization, lower academic performance, and reduced lifetime earnings.<sup>32</sup> Therefore, since most regulation increase the level of market movement and may reduce consumption through lower nominal prices, the likely resulting net job losses have long-term adverse effects. If the OMB extends the temporal frame of regulatory analyses, it also should require agencies to include long-term social costs such as these.

- **Treatment of Uncertainty.** Circular A-4 requires agencies to present both the upper and lower bound estimates of an uncertain value. Specifically, “you should provide expected-value estimates as well as distributions about the estimates, where such information exists. When you provide only upper and lower bounds (in addition to best estimates), you should, if possible, use the 95 and 5 percent confidence bounds.”<sup>33</sup> The TSD only presents the 95<sup>th</sup> percentile value at the three percent discount rate. It does not present the full distribution or the lower bound estimates. OMB’s draft TSD does not comply with OMB’s directive to other agencies.

The SCC memo violates this provision in two ways. First, it fails to gather from the underlying models the distribution of potential SCC values. Second, in its recommendations to agencies, it only presents one tail of the uncertainty for one parameter -- the 95th upper confidence value of the three percent discount rate across all three models.

- **Discount Rate.** As mentioned earlier, Circular A-4 requires the base case analysis to discount future benefits and costs at a seven percent discount rate. The TSD does not do so. As with the other methodological issues, there is no methodological basis to weigh this potential benefit greater than other future potential benefits (e.g., avoided cancer cases). Choosing a discount rate closer to zero effectively gives greater weight to the desires of uncountable numbers of future generations than to the desires of those who are alive now.

The analytic changes to align Circular A-4 with the TSD’s framework are a radical departure from OMB’s historic guidance to agencies. Both Democratic and Republican administrations have endorsed the seven percent discount rate since it represents the best available analysis of the long-term cost of capital. Both Democratic and Republican administrations have endorsed the framework of US residents and resources since US regulations are designed to increase the welfare of US citizens. The TSD upends this consensus.

If OMB chooses to move forward with the SCC TSD (after correcting its legal and peer review obligations), it should not do so until it makes all of the conforming changes in guidance to

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<sup>32</sup> For a recent summary, see Austin Nichols, Josh Mitchell, and Stephan Lindner, *Consequences of Long-Term Unemployment*, The Urban Institute, July 2013.

<sup>33</sup> Circular A-4, pg. 45.

Circular A-4, justify them in light of applicable legal requirements, and submit them for independent peer review. If OMB does not make the necessary and radical changes to Circular A-4, it should revise the TSD to be consistent with the current, peer-reviewed version of Circular A-4, and then issue the revised draft TSD and any supporting documentation for public review and comment.

Failure to do so would support a conclusion that OMB is systematically biasing analyses to overstate their social benefits. With the TSD, agencies will find positive net benefits in shifting greater wealth from today's US consumers in order to give greater welfare to unborn, future generations of mostly non-US residents.

Circular A-4 puts it this way:

Using the same discount rate across generations has the advantage of preventing time-inconsistency problems. For example, if one uses a lower discount rate for future generations, then the evaluation of a rule that has short-term costs and long-term benefits would become more favorable merely by waiting a year to do the analysis. Further, using the same discount rate across generations is attractive from an ethical standpoint. If one expects future generations to be better off, then giving them the advantage of a lower discount rate would in effect transfer resources from poorer people today to richer people tomorrow.<sup>34</sup>

## V. APPLICATION OF SCC ESTIMATES TO ONLY REGULATORY ANALYSIS BIASES OTHER FEDERAL ANALYTIC REQUIREMENTS

In addition to selectively changing one part of Circular A-4 and failing to submit the change to independent peer review, it is unclear why OMB proposes to change the analytic framework of only regulatory analyses. Other OMB circulars instruct agency analyses for other Federal purposes. If OMB were authorized to issue this SCC requirement as a rule (which it is not), it would also be arbitrary and capricious for OMB to apply it only to regulatory analyses and not to, among others, Circulars A-11, A-102 and A-129 on how the SCC should be taken into account in federal loan, grant, and direct program analyses. For example, does OMB intend to require the Department of Transportation and the US Army Corps of Engineers to include SCC estimates when evaluating potential water projects and highway projects? Many National Institutes of Health and National Science Foundation grants go toward projects that consume energy or otherwise release greenhouse gases. Will such projects also be evaluated using the SCC? Will OMB instruct the Council on Environmental Quality to revise its National Environmental Policy Act (NEPA) guidance? Will federal electric utilities be required to revise their economic analyses for investment in various generation technology options?

The U.S. Federal Government, by itself, annually consumes over one-trillion BTUs.<sup>35</sup> It is the

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<sup>34</sup> Circular A-4, pg. 35.

<sup>35</sup> See Table 1.12, U.S. Energy Information Administration, Annual Energy Review 2011, DOE/EIA-0384(2011), September, 2012.

source of enormous volumes of greenhouse gas emissions that, by the logic of EPA's endangerment finding, cause or contribute to global warming. As such, if the Federal Government believes it should impose the SCC on the private sector in regulatory decision-making, it begs the question of whether OMB intends to incorporate the SCC valuation in each energy transaction to account for this externality.

Failure to do so would render Federal analyses vulnerable to legal challenge. If DOE is required to incorporate the SCC into its energy efficiency rulemakings, it would be arbitrary for it not to do so when conducting a NEPA analysis for a loan guarantee to a biomass refinery or renewable energy loan guarantee recipient. Will the Corps use the SCC in its definitions of the waters of the US rulemaking? It would seem it should when estimating the environmental impact of waterway projects and harbor dredging. Considering SCC impacts will, at a minimum, slow down these projects and, for those waterway projects subject to benefit-cost analysis, deem some of them ineligible for Federal funds.

**VI. THE SCC ESTIMATES RELY ON MODELS AND INPUTS THAT INTRODUCE SO MUCH UNCERTAINTY AS TO MAKE THEM UNSUITABLE FOR POLICY DECISIONS**

The imprecision inherent in modeling assumptions, hypotheses, and judgments are significantly magnified when impacts (and costs) are projected over a longer time period. TFI argues that OMB and the IWG cannot estimate environmental impacts and costs beyond the capabilities of current science and economic modeling. There is a threshold beyond which uncertainties become so profound as to render resulting estimates unusable. Even the IPCC limits its future climate predictions and presents a range of possible scenarios out to 2100. That the 2013 SCC Estimate changed by 60 percent from previous estimates using the same set of models demonstrates that this exercise is massively uncertain and not sufficiently robust for policy-making.

OMB and the IWG rely on three models which purport to predict the ultimate costs of a long chain of impacts stemming from the emission of GHGs (*i.e.*, the impact of temperature on sea-level rise, the impact of sea-level rise on waterside cities, the monetization of the impacts on waterside cities, *etc.*). These models do not provide a detailed representation of the impact that climate change may have on health, the environment, or the (global or domestic) economy.

The models relied on by the IWG utilize simplifying assumptions and judgments reflecting the modeler's best attempts to aggregate the available scientific and economic research characterizing these relationships. In particular, the "damage functions" used in these models simply reflect a best guess of the relationship between emissions of greenhouse gases and changes in temperature and GDP.

As a result, the SCC Estimates are plagued by a high level of uncertainty that spans several orders of magnitude. This is especially true if socio-economic outputs are predicted over very

long time periods, as with the SCC Estimates.

In fact, a NERA report, as submitted in the comments referenced by ACC, et al. suggests that the range of potential SCC values based upon uncertainties in the damage function is even larger than the structural variations across the DICE, FUND and PAGE models. This variability is because the formulation and utilization of the damage function in the three models are *ad hoc* and arbitrary, lack any theoretical or empirical foundation, and depend crucially on the views of the individual model builders.

The “damage function” of the IAMs utilized by the IWG neglect the traditional elements of a true damage function approach. To develop the SCC Estimates, the determination of the health, environmental, and physical damages attributed to GHG emissions is left to the authors of the IAMs, who translate these effects into an estimate of economic damage using a simple overall damage function of GDP versus temperature change. In doing so, the IWG defers to the model authors critical evaluations of the causal framework between GHG emissions and climate change impacts; the concentration-response function for various climate effects; and the monetization of those effects.

Not only are such judgment-based damage functions highly variable, the variability and arbitrariness of these parameters can lead to profoundly different outcomes. For example, the *Damage Function Report* finds that projected damages (GDP changes) attributable to increased ambient temperatures can vary widely for seemingly small variations in the two parameters used to establish the rate of damage per unit of temperature change.

According to the 2013 TSD, the larger SCC values reflect only changes made to the underlying IAMs. All of the changes appear to be towards higher impacts. For the DICE model, the primary changes relate to explicit representation of sea level rise (“SLR”) and associated damages and an updated calibration of the carbon cycle. The primary changes in the FUND model are updated damage functions for space heating, SLR agricultural impacts, changes to transient response of temperature buildup of GHG concentrations, and inclusion of indirect climate effects of methane. For PAGE, the key changes mentioned were explicit representation of SLR damages, revisions to damage functions to ensure damages do not exceed 100% of GDP, changes to regional scaling of damages, revised treatment of potential abrupt damages and some updated assumptions on adaptation.

However, the IWG’s TSD does not delineate the arbitrary nature of how the updated IAMs have repeatedly changed the SCC estimates. For example, the authors of the DICE model claim the key damage function they used was based on a study by Tol (2009). However, inspection of the Tol (2009) study indicates that up until a temperature rise of 2 degrees Celsius, climate change results in an *increase* in GDP. In contrast, the damage function used in DICE presents a negative GDP change across all temperature changes considered. It is not clear how the authors of DICE altered the damage function presented in Tol (2009) or what the scientific basis was for this significant change.



Furthermore, the 25% increase in monetary value coming out of the updated 2013 DICE model was not produced by the IAM itself. Rather, the lead author, William Nordaus, added an adjustment of 25% to the monetary damages to adjust for certain factors, including biodiversity, ocean acidification, and sea level rise.

“The 2013 model instead uses a highly simplified damage function that relies on current estimates of the damage function. More precisely, DICE-2013R uses estimates of monetized damages from the Tol (2009) survey as the starting point. However, *current studies generally omit several important factors (the economic value of losses from biodiversity, ocean acidification, and political reactions), extreme events (sea-level rise, changes in ocean circulation, and accelerated climate change), impacts that are inherently difficult to model (catastrophic events and very long term warming), and uncertainty (of virtually all components from economic growth to damages). I have added an adjustment of 25 percent of the monetized damages to reflect these non-monetized impacts. While this is consistent with the estimates from other studies (see Hope 2011, Anthoff and Tol 2010, and FUND 2013), it is recognized that this is largely a judgmental adjustment.*”<sup>36</sup> (emphasis added.)

Economic damages should be scientifically derived, not assigned arbitrarily by one individual.

Similarly, the increase in the SCC in the PAGE model is based largely on the opinions of the authors as described in Hope (2011). In the updated PAGE2009 model used to derive the 2013 SCC figures, the authors assume far less adaptation will occur in response to climate change than they previously assumed. However, the authors cite no references to support this change. Nonetheless, this single change in assumption results in a 1.3-fold increase in the SCC versus the projections from PAGE2002. Another key change was how transient climate response (“TCR”), one of several components of climate sensitivity, was considered. In PAGE2009, a different triangular distribution of the TCR function was used than in PAGE2002. This resulted in a 1.5-fold increase in the SCC.

To provide another example, one researcher examined the FUND IAM and determined “*FUND estimates that all impacts of climate change, excluding the increased costs of air conditioning, would amount to a net benefit to the world.*”<sup>37</sup> (emphasis added.) Modeled outcomes such as this require greater scrutiny. Alternatively, perhaps the Administration could propose a worldwide ban on air conditioning.

The SCC calculations in the DICE, FUND and PAGE models are the product of a highly simplified and aggregated formulation of the detailed calculations of climate science that goes directly from projected change in temperature to economic loss stated as change in GDP.

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<sup>36</sup> Nordhaus, William and Paul Sztorc. “DICE 2013R: Introduction and User’s Manual.” October 21, 2013.

<sup>37</sup> Ackerman, Frank and Charles Munitz. “Climate damages in the FUND model: A disaggregated analysis.” *Ecological Economics* 77 (2012) 219–224.

The 2010 and 2013 SCC Estimates are ambitiously projected for very long time horizons – specifically, until 2300.<sup>38</sup> The 2013 Estimate notes that the DICE model, for example, can be run for an even longer time horizon (until 2595). The ability of any of these models (and their input assumptions) to hold for three centuries or more is not clear and certainly not verifiable. The fact that the SCC Estimates increased 60 percent and changed three times in three years provides sufficient evidence to question the viability and usefulness of modeling that purports to render predictions 300+ years into the future.

Importantly, the SCC estimates developed through IAMs were never designed to address cost-benefits of specific regulatory actions. The IWG has misapplied the use of the IAMs to rulemaking SCC by relying on IAMs that include inappropriately long time horizons that are not reflective of marginal avoided emissions from a specific rulemaking, necessarily resulting in inflated cost estimates. The IWG should not consider IAM outputs beyond the atmospheric lifetime of the greenhouse gas for which they are targeting in a rule and for which they are attempting to estimate social costs. For example, the atmospheric lifetime of carbon dioxide is believed to range from 5 to 200 years, depending on numerous removal processes involved. Because carbon dioxide decay varies so significantly, a generally accepted value is 100 years. In fact the global warming potential (GWP) of all greenhouse gases (GHGs) is calculated relative to a GWP of 1 for carbon dioxide over a 100-year period. So, if OMB is applying SCC estimates to rules that may avoid carbon dioxide emissions, the IAMs should be run for a shorter, more technically defensible time period.

In contrast, the Intergovernmental Panel on Climate Change (“IPCC”) does not attempt predictions beyond the year 2100. This constraint is due to the widely predicted variances in critical inputs, such as predicted model emissions. Clearly, attempting to extrapolate further to 2300 is simply too speculative and uncertain for use in policy-making.

OMB and IWG do not present the SCC Estimates in a way that appropriately quantifies uncertainty. OMB and IWG also inappropriately fail to incorporate median or 50<sup>th</sup> percentile values despite enormous uncertainty, and fail to evaluate the domestic SCC as required under OMB Circular A-4. These and a myriad of other questionable assumptions and approaches diminish the utility and applicability of the SCC Estimates.

The U.S. Court of Appeals for the D.C. Circuit has discussed what an agency must do to support the use of models for agency decisionmaking. According to the court, an agency “must provide a complete analytic defense of its model [and] respond to each objection with a reasoned presentation.” The court cautioned that the “technical complexity of the analysis does not relieve the agency of the burden to consider all relevant factors.” Furthermore, in justifying its use of a model, an agency must demonstrate “a rational connections between factual inputs, modeling assumptions, modeling results and conclusions drawn from those results.”<sup>39</sup> Use of the 2013 SCC Estimates in rulemaking will result in agency violations of the Administrative Procedure Act (“APA”), as interpreted and developed by the courts. As discussed in comments above, it is

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<sup>38</sup> 2013 Estimate at 7.

<sup>39</sup> *Sierra Club v. Costle*, 657 F.2d 298, 333 (D.C. Cir. 1981) (internal quotations omitted).

unclear what roles each of the IWG participating agencies actually played in developing the estimates. It is unclear how the three models that underlie these estimates were selected or how the inputs for the model runs were selected or developed, including both policy as well as technical choices, or how the various statistical Monte Carlo analyses actually were implemented. Even if the three models themselves were entirely sound, the inputs into those models most certainly render the model output (*i.e.*, the SCC Estimates) arbitrary and capricious. OMB has not explained any of these matters, or disclosed the technical or policy information it considered in making these decisions.

Similar to the 2010 Estimates, the 2013 Estimates are based on the average outputs of the three models. Individual model predictions, however, vary significantly. For example, at a 3% discount rate, the cost per ton varies from a high of \$71/ton for PAGE to \$21/ton for FUND, with the DICE estimate in between at \$38/ton. While the differences in the average values among the models are problematic, the predicted model variances are of greater concern. The FUND mean prediction of \$21/ton becomes useless for policy decisions when the corresponding variance is predicted to be \$22,487. The same can be said for each of the other SCC Estimates.

Using the 3% discount rate as an example, the average values versus the 50<sup>th</sup> percentile values per ton for the PAGE, DICE, and FUND models are \$71/\$27, \$38/\$34, and \$21/\$17, respectively. Therefore, for the PAGE, DICE, and FUND models, the value used to derive the final SCC figure of \$43/ton at the 3% discount rate is the 75th percentile value for the PAGE model and the overall SCC value of \$43.1 per ton corresponds to the 68<sup>th</sup> percentile. Thus, the high end tail of the distribution of the PAGE model has an important influence on the final SCC Estimates. These final SCC Estimates should not be viewed as central figures, but rather skewed toward the upper tail of the distribution of SCC values.

The IWG and OMB have failed to disclose and quantify key uncertainties and to inform fully decision-makers and the public of those uncertainties as required by OMB. The 2013 TSD should be amended to include a separate section that identifies the key sources of uncertainty in the derivation of the SCC. This section should include a qualitative assessment of the impact of key factors on the final SCC values and to the extent feasible, a quantitative assessment of these factors.

Further, by presenting only global SCC estimates, and excluding domestic SCC estimates altogether, the IWG ensures that the SCC Estimates will not be useful for cost-benefit analysis. OMB Circular A-4 mandates calculation of a domestic estimate in federal United States rulemakings, with non U.S. estimates considered as *optional* – the reverse of presentation published by IWG/OMB. Moreover, the 2013 TSD's table does not mention the global nature of the values or note that the domestic SCC is a small fraction (6-23%) of the global SCC.

TFI strongly recommends presenting the domestic SCC figures in RIAs. Consistent with OMB guidance, the costs of a rule for entities in United States should be presented in comparison with the benefits occurring in the United States.

The IAMs include sub-regions, including the U.S./North America, which can be modeled independently and would provide an SCC estimate that is (directionally) more appropriate for cost-benefit analyses of U.S. regulatory actions. The sub-regional U.S./North America model run results can be used to either support or undermine the IWG's statement in its 2010 Technical Support Document (TSD) that the U.S. benefits (assuming all other model assumptions are correct) are only 7-10 percent of the global benefit, suggesting the SCC should be discounted by up to 93 percent.

OMB and IWG also should run all global regions in the IAM(s) except for the U.S./North American region, to arrive at a non-U.S. SCC estimate. This number is anticipated to be higher than the IWG's global SCC estimate, reflecting the relatively low carbon intensity of the U.S. economy when compared to the rest of the world, and suggesting the Administration's policies should weight reduction of international carbon emissions more heavily than domestic reductions, underscoring that domestic-only regulation through the SCC Estimates is an inappropriate policy tool.

Moreover, the application of the SCC Estimates solely to domestic rulemakings, while estimating global benefits, fails to discount the SCC estimate for carbon leakage. *I.e.*, as domestic costs of production of goods and services increase due to adoption of the SCC Estimates, a fraction of that production and the associated emissions (as well as the corresponding social and economic benefits) will move overseas, partially offsetting the estimated benefits of avoiding carbon emissions. OMB and the IWG have not even attempted to calculate the carbon leakage of the proposed approach. To do so, OMB and IWG should run all of the sub-regions in the IAM(s) to maximize the economic objective function, and then run it again but constrain the emissions of the U.S./North American region to optimize policies by a reduction of the same "increment" (*i.e.*, pulse, delta), in each year, that is used to estimate the SCC in the globally aggregated model. Comparing the ratios of emissions from all non-U.S./North American regions in both runs will arrive at an estimated percentage of carbon leakage for which the SCC should be further discounted.

The IWG's SCC estimate does not reflect an appropriate range of uncertainty based on testing the sensitivity to numerous model inputs. For example, the IWG did not test or solicit peer review regarding the current IAMs estimates of the global average SCC based on a delta in emissions by modeling a 'pulse' of 1 billion metric tons of carbon emissions in any given year. Are the models sensitive to a change in this pulse that is more reflective of emissions avoided by a single rule and likely several orders of magnitude less than the pulse applied in the IAMs (which were not designed for application to a rulemaking)? The current IAM methodologies and potential for bias and sensitivity (given the IAMs' nonlinear damage functions) should be tested for a pulse of a much smaller change in emissions that may better represent a marginal emission increase/decrease associated with any given regulation (particularly in light of the IWG's 2010 TSD admission that "federal regulatory actions can be expected to have marginal impacts on global emissions"). Under a more transparent approach to developing SCC Estimates, sensitivity analyses and additional model runs could be performed on numerous other IAM inputs/assumptions.

## **CONCLUSION**

TFI is pleased to have the opportunity to comment on this important issue. Given the significant statutory and regulatory process shortcomings, lack of peer review, and weaknesses and uncertainties in the modeling systems highlighted in these comments, TFI urges OMB and the IWG to withdraw the 2010 and 2013 Technical Support Documents, pending correction through an informed, transparent, and public process. Moreover, TFI believes that, even with additional analytical work discussed above, the uncertainties would not be reduced sufficiently for the SCC to be the basis of reasoned policy determinations. TFI therefore asks OMB to refrain from using the SCC Estimates and to direct publicly other executive branch agencies not to utilize the SCC Estimates as part of any regulatory action or policy-making.

If you have further questions regarding these comments, please do not hesitate to contact me or my staff at (202) 515-2700 or via e-mail at [wfoster@tfi.org](mailto:wfoster@tfi.org).

Sincerely,

A handwritten signature in black ink, appearing to read 'CJahn', with a long horizontal flourish extending to the right.

Chris Jahn  
President

## ATTACHMENT

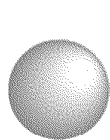
Evolution of Recent Social Cost of Carbon Values Used in Rulemaking			
Date	Cite	Value	Notes
May 2, 2008	73 FR 24414	\$7/tonne domestic value <sup>40</sup>	Midpoint between \$0 and \$14; <a href="#">Proposed Average Fuel Economy Standards, Passenger Cars and Light Trucks; Model Years 2011–2015</a>
Oct 17, 2008	Page xxi	\$2/tonne domestic value	Reference case value in <a href="#">NHTSA’s 2011-2015 FEIS</a> in the Federal Register. See 73 FR 61859 for the EPA notice of data availability.
Oct 17, 2008	73 FR 62110	\$0 to \$20/tonne <sup>41</sup>	Proposed Energy Conservation Standards for Certain Consumer Products (Dishwashers, Dehumidifiers, Microwave Ovens, and Electric and Gas Kitchen Ranges and Ovens) and for Certain Commercial and Industrial Equipment (Commercial Clothes Washers)
Mar 30, 2009	74 FR 14339	\$7/tonne domestic value <sup>42</sup>	NHTSA published a Final Rule promulgating the fuel economy standards for MY 2011 only, because of a <a href="#">Jan 26 2009 Presidential memo</a>
Apr 8, 2009	74 FR 16079	\$0 to \$20/tonne	DOE Final Energy Conservation Standards for Certain Consumer Products (Dishwashers, Dehumidifiers, Microwave Ovens, and Electric and Gas Kitchen Ranges and Ovens) and for Certain Commercial and Industrial Equipment (Commercial Clothes Washers)
Sep 25, 2009	Page 2-18	\$20/tonne domestic value	NHTSA’s Draft Environmental Impact Statement to disclose and analyze the potential environmental impacts of proposed Corporate Average Fuel Economy (CAFE) standards for model year (MY) 2012-2016 passenger cars and light trucks (45 days comment period)
Sep 28, 2009	74 FR 49477	\$20/tonne global value (growing at 3% thereafter)	Proposed Rulemaking To Establish Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards MY 2012-2016
May 7, 2010	75 FR 25343	\$21/tonne global (in 2010, and growing 3% thereafter).	Final Joint Rule Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards MY 2012-2016
Dec 1, 2011	76 FR 74882 and 76 FR 75292 fn774	\$22/tonne global (in 2010, and growing thereafter).	Proposed 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards
Feb 14, 2012	77 FR 8555	\$21/tonne global (in 2010, and growing	Proposed Energy Conservation Standards for Standby Mode and Off Mode for Microwave Ovens

<sup>40</sup> NHTSA “elected to use the midpoint of the range from \$0 to \$14 (or \$7.00) per metric ton of CO<sub>2</sub> as the initial value for the year 2011, and assumed that this value would grow at 2.4 percent annually thereafter.”

<sup>41</sup> DOE assigned a range for the SCC of \$0 to \$20 (\$2007) per ton of CO<sub>2</sub> emissions and grew it at 2.4% annually.

<sup>42</sup> NHTSA used the midpoint of the range from \$0 to \$14, or \$7.00, per metric ton of CO<sub>2</sub> as the initial value for the year 2011, and assumed that this value would grow at 2.4 percent annually thereafter.

Evolution of Recent Social Cost of Carbon Values Used in Rulemaking			
Date	Cite	Value	Notes
		thereafter).	
Jul 2012	Page 5-26	\$23/tonne global (in 2012, and growing thereafter).	NHTSA's published FEIS for 2017-2025
Jun 17, 2013	78 FR 36351	\$33/tonne global (in 2010, and growing thereafter).	Final Energy Conservation Standards for Standby Mode and Off Mode for Microwave Ovens



**RUBBER**  
manufacturers  
association

1400 K Street, NW • Washington, DC 20005 • tel (202) 682-4800 • fax (202) 682-4854 • www.rma.org

February 26, 2014

Office of Information and Regulatory Affairs  
Office of Management and Budget  
Attn: Mabel Echols  
NEOB, Room 10202  
725 17th Street N.W.  
Washington, D.C. 20503

Re: Technical Support Document: Technical Update of the Social Cost of Carbon for  
Regulatory Impact Analysis Under Executive Order No. 12866;  
Docket ID OMB-OMB-2013-0007

RMA is the national trade association representing major tire manufacturers that produce tires in the United States, including Bridgestone Americas, Inc., Continental Tire the Americas, LLC; Cooper Tire & Rubber Company; The Goodyear Tire & Rubber Company; Michelin North America, Inc.; Pirelli Tire North America; Toyo Tire Holdings of Americas Inc. and Yokohama Tire Corporation. RMA members thank the Office of Management and Budget (OMB) for your consideration of these comments on the social cost of carbon (SCC) estimates present in the Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866.<sup>1</sup>

RMA members may be impacted by the SCC estimates because they manufacture tires and have an interest in future mobile source regulations developed by the National Highway Traffic Safety Administration (NHTSA) and the Environmental Protection Agency (EPA) to set corporate average fuel economy standards and reduce CO<sub>2</sub>, and also have an interest in future regulations developed by EPA to regulate CO<sub>2</sub> emissions and other greenhouse gas emissions from industrial facilities. Future Federal regulations that seek to reduce CO<sub>2</sub> emissions from mobile and stationary sources could be based on the SCC estimates. Due to the lack of transparency in deriving the SCC estimates RMA strongly recommends that the SCC estimates should not be used in rulemakings, and OMB should withdraw and revise the SCC estimates in an open and transparent process.

**I. The SCC estimates were not derived in an open transparent process**

In the *Center for Biological Diversity v. National Highway Traffic Safety Administration*<sup>2</sup>, the court held that the final Average Fuel Economy Standards for Light Trucks,

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<sup>1</sup> Interagency Working Group on Social Cost of Carbon, United States Government, *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866* (February 2010) (“2010 Estimate”).

<sup>2</sup> 508 F.3d 508 (2007)



Model Years 2008-2011<sup>3</sup> was arbitrary and capricious and contrary to the Energy Policy and Conservation Act of 1975 because NHTSA failed to monetize the value of carbon emissions. Specifically, the court held that the value of carbon emissions reductions is not zero. The matter was remanded to NHTSA to promulgate new standards that include a monetized value for the benefit of reducing carbon emissions.

The SCC estimates represent specific monetary values per metric ton of CO<sub>2</sub> intended to be used in regulatory impact analyses required under Executive Order 12866 to estimate the costs and benefits of major federal regulations. The SCC estimate was developed by an Interagency Working Group (IWG) and is based on a number of models and data inputs. The IWG has revised the SCC estimates three different times from 2010 to 2013. OMB has not disclosed the identity of the agencies and entities that made up the IWG.

The IWG and OMB have not disclosed why specific models were selected to generate the SCC estimate or the data inputs and assumptions that were put into the models. Without an understanding as to the process for selecting the models, data inputs and assumptions, RMA is unable to determine whether the SCC estimate is reliable and supportable. We ask that OMB identify the strengths and weaknesses of the DICE, FUND, and PAGE models, identify any inherent biases that exist in the models, and explain the process and rationale for choosing these models. We also ask that OMB provide the data inputs, and explain the process to select the data inputs and rationale for the data inputs that were used in the models.

While RMA appreciates the opportunity to provide public comments on the SCC revised estimate, the public comment period is not fully achieved without the opportunity to know the data inputs for the models used to generate the SCC estimates and the opportunity to provide comment on that data. Several members of Congress have made requests for OMB to provide the data inputs or information necessary to fully evaluate the SCC estimates. To date, OMB has not provided this information.

Despite this public comment period on the Technical Support Document, the U.S. Department of Energy (DOE) is continuing to use the SCC Estimates<sup>4</sup> in rulemakings. For example, DOE recently proposed energy conservation standards for residential furnace fans. The SCC was used as a basis to justify the residential furnace fans proposed rule. RMA members question whether OMB intends to use the public comment process on the SCC estimates to update and improve the SCC because DOE has not waited for the comment period to close and instead continues to propose rulemakings that include and are supported by the SCC. Additionally, it is not understood from the Technical Support Document, how OMB, the IWG, or other agencies will consider and respond to public comments and ultimately revise SCC estimates. RMA members also do not understand, and seek additional clarification, regarding how OMB will implement the use of revised SCC estimates in future rulemakings.

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<sup>3</sup> 71 Fed.Reg. 17,566 (Apr. 6, 2006)

<sup>4</sup> 78 Fed. Reg. 79,419 (Dec. 30, 2013).

## **II. Use of the SCC estimates in rulemakings violates the Administrative Procedures Act (APA)**<sup>5</sup>

Use of the 2010 and 2013 SCC estimates in rulemaking will result in agency violations of the APA. The APA requires a court to set aside agency actions, findings, and conclusions that are found to be arbitrary, capricious, abuses of discretion, not in accordance with law, or without observance of procedure required by law.<sup>6</sup> It would be arbitrary and capricious for an agency to use the SCC estimates to justify a rulemaking without knowing the rationale and justification for selecting the models, data inputs, and assumptions used to create the SCC estimates. Agencies engaged in rulemaking must articulate why a rule includes or does not include certain requirements. Failure to offer a “rational connection between the facts and judgment,” will render the agency decision arbitrary and capricious under the APA.<sup>7</sup>

Use of the SCC Estimates in rulemaking will not meet the requirements of the APA as interpreted by the courts because the IWG and OMB have not provided a rational connection or sufficient justification for the models, data inputs and assumptions used to create the SCC estimates. To date, stakeholders do not know the roles each of the IWG participating agencies played in developing the estimates. Additionally, stakeholders do not know how the three models that underlie the SCC estimates were selected or the justification for the use of the three models. Last, it is not clear who developed the inputs for the model runs and there is no justification provided as to why the data inputs were selected or justification for the assumptions that were made in the models. This missing information highlights the flaws and uncertainties that preclude the use of the 2010 and 2013 SCC Estimates in agency rulemakings.

## **III. Revisions of the SCC estimates should be done through a transparent process that includes full peer review**

RMA recommends that SCC estimates should be revised through a transparent process that includes full peer review of the data inputs and assumptions. OMB’s Formal Information Quality Bulletin for Peer Review specifies that “peer review is one of the most important procedures to ensure that the quality of published information meets the standards of the scientific and technical community.”<sup>8</sup> Additionally, EPA recognizes in its Peer Review Handbook that peer reviews are conducted to ensure that activities are technically supportable, competently performed, properly documented, and consistent with established quality criteria.<sup>9</sup>

Peer review of the SCC estimates is needed to ensure that the models were not manipulated and the data inputs and assumptions are defensible. A full peer review of the SCC estimates from 2010 to 2013 may also help to inform stakeholders as to why the May 2013 SCC estimates is 60% higher than the 2010 SCC estimates. RMA again recommends that a full peer

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<sup>5</sup> 5 U.S.C. § 706.

<sup>6</sup> *Id.*

<sup>7</sup> *Motor Vehicle Mfrs. Ass’n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983).

<sup>8</sup> Memorandum for Heads of Departments and Agencies from Josh B. Bolton, Director, OMB “Issuance of OMB’s ‘Final Information Quality Bulletin for Peer Review’” at 2 (Dec. 16, 2004).

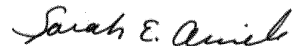
<sup>9</sup> *Peer Review Handbook, 3<sup>rd</sup> Edition, Prepared for the U.S. Environmental Protection Agency by Members of the Peer Review Advisory Group for EPA’s Science Policy Council*, EPA/100/B-06/002.

Comments by the Rubber Manufacturers Association  
Docket ID OMB-OMB-2013-0007  
February 26, 2014

review of the data inputs, assumptions and SCC estimates be conducted, and sufficient justification should be provided for the use of inputs and assumptions that were used in the models.

RMA again thanks OMB for this opportunity to comment on the SCC estimates. Please contact me at (202) 682-4836 if you have questions or require additional information.

Respectfully Submitted,

A handwritten signature in cursive script that reads "Sarah E. Amick".

Sarah E. Amick  
Senior Counsel  
Rubber Manufacturers Association

**From:** Marten, Alex  
**Importance:** Normal  
**Subject:** HOLD - SCC  
**Start Date/Time:** Mon 4/20/2015 6:30:00 PM  
**End Date/Time:** Mon 4/20/2015 7:00:00 PM

**From:** Gordon, Jessica M  
**Location:** DCRoomWJCS4228AOAP/DC-OAR-OAP  
**Importance:** Normal  
**Subject:** SCC and regulation (DC Bar webinar)  
**Start Date/Time:** Tue 3/31/2015 4:00:00 PM  
**End Date/Time:** Tue 3/31/2015 5:30:00 PM

Kate and I will be watching the DC Bar's brownbag on SCC and regulation from 4228; please feel free to bring your lunch.

**From:** Marten, Alex  
**Importance:** Normal  
**Subject:** SBCA SCC Session  
**Start Date/Time:** Wed 3/18/2015 5:00:00 PM  
**End Date/Time:** Wed 3/18/2015 10:00:00 PM

...  
'''

**From:** Marten, Alex  
**Importance:** Normal  
**Subject:** NAS BECS Board Meeting  
**Start Date/Time:** Wed 2/11/2015 5:00:00 AM  
**End Date/Time:** Thur 2/12/2015 5:00:00 AM

Potential SCC discussion in the afternoon



## **Putting a Carbon Price on Federal Coal: Legal and Economic Issues**

**(DRAFT: DO NOT CITE OR QUOTE)**

**Alan Krupnick, Joel Darmstadter, Nathan Richardson, and Katrina McLaughlin<sup>1</sup>**

*January 28, 2014*

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### Introduction

This report explores the legal and economic questions raised by implementing a policy on federal coal lands that takes into account greenhouse gas emissions (GHGs) over the entire coal lifecycle. The goal of such a policy would be to internalize the climate-related damages from CO<sub>2</sub> and other greenhouse gases (termed the social cost of carbon) at the coal leasing (or upstream) stage through terms and conditions established by the U.S. Bureau of Land Management (BLM), either in the planning process or for tracts being offered for sale.

There are many ways to internalize external costs related to climate change. Some of these take a downstream approach, i.e., focusing on the uses of fossil fuels, and others take an upstream approach, i.e., focusing on the sources of fossil fuels. Most federal policies take the downstream approach. The US Environmental Protection Agency (EPA) is attempting to at least partially internalize power plant CO<sub>2</sub> emissions through its Clean Power Plan (CPP).<sup>2</sup> EPA and the National Highway Traffic Safety Administration (NHTSA) have issued rulemakings significantly increasing fuel economy standards (and therefore reducing CO<sub>2</sub> emissions) for light- and heavy-duty vehicles, although the light-duty rulemaking is subject to a mid-term review next year (McConnell 2013; Krupnick et al. 2014). Before that, another attempt to use a downstream approach – a cap and trade program introduced by Congressmen Waxman and Markey – failed in Congress (H.R. 2454).

At the same time, there have been calls, particularly from the environmental community, to internalize externalities upstream, at the wellhead or the mine, or even further upstream applied to the oil, gas and

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<sup>1</sup> The authors are at RFF, except for Nathan Richardson who is a Visiting Fellow at RFF and on the Law Faculty at the University of South Carolina. Philip Gass and colleagues at the International Institute for Sustainable Development, Canada contributed to the analysis of the Alberta coal leasing program. The authors would like to thank the Paul G. Allen Family Foundation for its generous grant, and Molly Macauley for her close reading and suggestions.

<sup>2</sup> Currently a proposed rulemaking, “Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units; Notice of proposed rulemaking.” 79 FR 34829 (18 June 2014) (amending 40 CFR 60)



coal resources in the ground.<sup>3</sup> These calls have joined a series of lawsuits by environmental groups regarding BLM's handling of a Colorado coal lease (which included concerns about methane emissions upstream at the mine)<sup>4</sup> and the need for BLM to develop programmatic planning documents and include climate change considerations within them.<sup>5</sup> Relatedly, the Obama Administration has also shaped this issue by releasing a new draft guidance on inclusion of climate change impacts by agencies (including BLM) in their documents prepared under the National Environmental Policy Act (NEPA), and use of the social cost of carbon estimate applicable to Regulatory Impact Analyses and developed by the Interagency Working Group on the Social Cost of Carbon (IWG) (Council on Environmental Quality 2014).

The most significant upstream regulatory effort was a Clinton-era BTU tax which failed in Congress (Erlandson 1994; Milne 2008; Royden 2002). And, recently, Senators Whitehouse and Schatz released the draft of a proposed bill calling for a carbon tax levied at the well and mine.<sup>6</sup> Senator Markey has announced plans to draft legislation halting new federal coal leases until the program has been reviewed, although this review is not necessarily tied to its failure to internalize climate externalities (Office of Senator Markey 2014). With prospects for the Clean Power Plan uncertain and given the urgency of finding a way to internalize global warming externalities, it is worth taking a closer look at an upstream approach, starting with the second most CO<sub>2</sub>-intensive energy sector – coal, and with the federal coal leasing program.

This is admittedly only a partial policy solution—coal on federal lands accounts for a significant portion of US production, 40% in 2013 – but the remainder on private and state lands would not be subject to added regulation (EIA, *Sales of Fossil Fuels Produced from Federal and Indian Lands*, 2014). Moreover, a policy aimed at coal's climate externalities does not address emissions from other fuels and activities. Nevertheless, addressing externalities from coal on public lands is a significant start. It also reflects the Federal government's duties to protect the public interest and its stated commitment to leadership on climate change. Perhaps most importantly, if BLM can address these carbon externalities under existing law, this would be an important advantage given political gridlock in Congress.

After considering BLM statutory and regulatory authority, the social cost of carbon estimates developed by the IWG, and economic considerations arising from instituting a carbon charge upstream for the BLM coal leasing program, we reach the following conclusions:

- BLM is required by statute to consider the environment in making multiple use decisions for the public lands it administers, and its coal leasing statutes give it broad discretion to set financial terms of leases – rents, royalties, and to a lesser extent, bonus bid minimums.
- Nevertheless, the legal arguments against BLM environmental charges (such as a carbon charge) are strongest if such charges result in a complete or at least very large abrupt reduction in coal

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<sup>3</sup> In its report *Leasing Coal, Fueling Climate Change*, Greenpeace uses the SCC to calculate potential emissions from all federal coal leased during the Obama Administration and argues that the program is incompatible with stated Administration climate goals. Nidhi Thakar of the Center for American Progress also calls for an SCC applied in the fair market valuation (FMV) prepared for a lease sale in her report *Modernizing the Federal Coal Program*.

<sup>4</sup> *High Country Conservation Advocates, et al. v. US Forest Service, et al.* (Civil Action No. 13-cv-01723, D.C. Colorado, 2014) and *Western Organization Resource Councils, et al. v. Jewell, et al.* (Case No. 1:2014cv01993, D.C. DC, filed 2014).

<sup>5</sup> Joining in this suit is the Paul G. Allen Family Foundation, whose grant made this RFF work possible. RFF is in no way connected to the suit or the opinions expressed therein.

<sup>6</sup> 113<sup>th</sup> Congress, American Opportunity Carbon Fee Act. While the bill has not been formally introduced, the full text can be downloaded from the following press release on Sen. Whitehouse's website:  
<http://www.whitehouse.senate.gov/news/release/sens-whitehouse-and-schatz-introduce-carbon-fee-legislation>

- extraction from federal lands.
- Locating a carbon charge (we use this term synonymously with the social cost of carbon) at the royalty stage of BLM's leasing process makes the most economic sense and is subject to fewer legal constraints than some alternatives.
- Using the social cost of carbon estimates developed by the IWG, the external costs associated with the combustion of federal coal are much greater than its average price at the mine (although only somewhat greater than the average price paid by electric utilities. If this SCC were immediately applied to all U.S. coal, the industry and economy would be greatly disrupted.
- Several additional considerations should influence applying the SCC as developed by the IWG to the BLM coal leasing program. Some of these transcend the BLM *per se* to a more general discussion of the SCC and include: uncertainty in the estimates; the question of whether a global or domestic damage estimate should be used; the exclusion of damages from non-CO<sub>2</sub> gases in the SCC; and the original development of the SCC for use in supporting documents (i.e. Regulatory Impact Analyses), rather than in operational decisions (e.g., sale of a particular lease tract).
- The lack of competition (i.e., the fact that there is usually only one bidder) in the federal coal market is a severe hindrance to taking a market approach to account for climate damages from coal, as a bidder could simply drop their bid price by the amount of the carbon charge (assuming BLM also adjusts its Fair Market Value estimates downward), possibly leaving the overall bid price unchanged.
- Since coal production on BLM-leased lands is only 40% of total coal production, any internalization policy by the coal market will be partial. How much coal production would shift to state and private lands, or to imports or other energy sources, is critical to determining the effect of the intervention on overall CO<sub>2</sub> emissions from the sector and is an area of further research.
- Additionally, the fraction of federal coal that would immediately come under a carbon charge is unclear. BLM does not generally have the authority to change lease terms within a contract period (20 years initially and 10 years thereafter).
- An upstream policy on lifecycle carbon emissions associated with federal coal must take downstream policies into consideration. Significant policy interactions include those with the proposed EPA Clean Power Plan, which would internalize at least some of federal coal's GHG emissions, since most coal consumption in the US is for electric power generation.

Given these conclusions, we recommend that BLM consider adding a small premium to the royalty charge to set a precedent for upstream policies to internalize GHG emissions. We would recommend that this charge not discriminate between coal for domestic use or exports, although companies selling into the EU and other places where carbon caps or taxes are in place could get a rebate. Such a rebate could also be appropriate as an offset to mandated emissions reductions under the proposed Clean Power Plan. It would be still more ambitious and effective for upstream charges to be imposed on both existing and new or renewed coal leases. Ultimately, and for maximum efficiency, such charges should be applied to all fossil fuels extracted from federal, state and private lands. A schedule of charges that increases slowly over time to hit an agreed target for the social cost of carbon so as to provide full internalization of climate damages would give the economy time to adjust.

Section 1 considers existing US legal authority to set terms and conditions (such as an additional tax or fee) applied to the lease sale, the annual lease rental, or the royalty payments tied to production (with Box 1 considering some of these issues for Alberta, Canada to provide a different perspective). Although the SCC could be applied further upstream of this point when BLM makes land use planning decisions, or

further downstream after coal lease terms and conditions are set, the focus of this paper is BLM's authority at the leasing stage (although we do address the planning issue in Box 3). Section 2 discusses the SCC and its suitability for use in internalizing carbon costs in federal coal leasing. Section 3 looks at economic and other implications of applying the SCC. Section 4 provides a summary of key findings and uncertainties and outlines needs for further study.

## 1. Legal Issues

### 1.1 BLM's Statutory Authority

This sub-section details legal arguments for and against statutory authority to impose charges on coal leases related to the climate change impacts of combustion of extracted coal. The arguments in favor are discussed first, followed by the arguments against. For two of the three lease-related payments - rents and royalties - federal authority appears sufficient to impose at least some additional carbon charge, at least for new leases. The reverse appears to be true for the third lease-related payment, bonus bids. But even where these arguments are strong they are far from certain. In any case, litigation is likely in the event of such a policy change. There is therefore some legal risk that courts will reject imposition of carbon or other environmental charges on the grounds that they exceed statutory authority or are inconsistent with explicit or implied principles embodied in the statute, regardless of their form and location within the leasing process.

#### 1.1.1 Federal Land Management Principles

The vast majority of federally-owned land, including most BLM land, is administered under the policy of "multiple use", as set forth in the Federal Land Policy and Management Act (FLPMA) of 1976.<sup>7</sup> This policy requires BLM to balance competing uses, including mineral extraction, on federal lands. Federal law also gives BLM broad authority to structure the coal leasing process. The Mineral Leasing Act of 1920, as amended by the Federal Coal Leasing Amendments Act of 1976,<sup>8</sup> provides that BLM will designate which lands are open for leasing, conduct a competitive bidding process, and set and collect royalties for coal extracted from federal land.

Federal law sets out background principles for mineral development on federal lands as "the development of economically sound and stable domestic mining...industries" and "the orderly and economic development of domestic mineral resources...to help assure satisfaction of industrial, security and environmental needs" (among other factors not relevant here).<sup>9</sup> As noted above, BLM is charged generally with administration of federal lands consistent with "multiple use"<sup>10</sup> and "sustained yield,"<sup>11</sup> "in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and agricultural values," "in a manner which recognizes the Nation's

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<sup>7</sup> Codified at 43 USC §1701 et seq.

<sup>8</sup> Codified at 30 USC §201 et seq.

<sup>9</sup> 30 USC §21(a)

<sup>10</sup> "Multiple use" is defined at 43 USC §1702(c), and envisions a balance between extractive and non-extractive use and between the needs of current and future generations. The definition also explicitly declares that "the greatest economic return" is "not necessarily" the dominant consideration in use decisions.

<sup>11</sup> "Sustained yield" might be interpreted to bar BLM policies that prevent or even substantially impede extractive uses. The term is defined, however, only to apply to *renewable* resources on federal lands (e.g., forests). See 43 USC 1702(h). There therefore appears to be no explicit commitment to "sustained yield" of coal or other minerals.

need for domestic sources of minerals,” and such that the federal government receives “fair market value” for uses and extracted resources.<sup>12</sup> Balancing these competing values is a complex task left almost entirely to BLM’s discretion.

### 1.1.2 Local and Global Impacts

BLM has always considered *local* environmental impacts (such as effects on endangered species) in determining which lands will be made available for leasing and in developing land use plans for those areas which are made available (though there is debate over whether BLM has given adequate weight and attention to these local impacts). Both BLM land use plans and documents prepared pursuant to NEPA – i.e., environmental assessments, environmental impact statements, and findings of no significant impact – detail consideration of such impacts.

Could BLM consider broader climate-related impacts in addition to these local impacts? Recent challenges to BLM environmental reviews under NEPA have attempted to force the agency to consider broader climate-related impacts in these reviews.<sup>13</sup> To some extent, federal agencies have resisted pressure to consider broad climate impacts, but BLM almost certainly *could* consider such impacts in NEPA environmental assessments and/or environmental impact statements associated with individual leases or broad land use plans if it wanted to do so. Most of the statutory language (referenced above) directing BLM to consider environmental impacts does not distinguish between local and widespread environmental impacts of extraction.<sup>14</sup> Our focus here, however, is not on BLM authority under NEPA to generally consider climate impacts in its leasing decisions, but the agency’s authority to consider those impacts in setting lease-related fees.

### 1.1.3 The Leasing Process

BLM is given specific statutory authority over the leasing process, but retains broad discretion in implementing that authority. The agency is authorized to “divide [federal] lands . . . into leasing tracts,” offer these tracts for leasing by competitive bidding, and to accept bids that exceed the “fair market value” of the lease. These leases are set by statute and BLM regulation at 20-year terms (though they may be terminated early for nonproduction).<sup>15</sup> Lease terms may be readjusted, however, at the end of

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<sup>12</sup> 43 USC §1701(a)

<sup>13</sup> For example, a ruling in the US District Court of Colorado found that “the treatment of the costs associated with GHG emissions from the mine was arbitrary and capricious” and pointed to the SCC developed by the IWG as an appropriate tool to quantify such greenhouse gas emissions (*High Country Conservation Advocates, et al. v. US Forest Service, et al.*, 16). Agency approval of the exploration plan and lease modifications was vacated in a subsequent ruling, preventing the lease expansion at hand from moving forward. The rulings did not focus on global versus local impacts, but rather the appropriateness and scientific certainty of an SCC to quantify climate impacts. See *High Country Conservation Advocates, et al. v. US Forest Service, et al.* Case 1:13-cv-01723-RBJ (US DC Colorado, 2014).

<sup>14</sup> The White House Council on Environmental Quality has recently released and solicited comment on a new draft guidance for agencies (including BLM) on how climate impacts should be considered in agency decisions and NEPA reviews. See Council on Environmental Quality, *Revised Draft Guidance for Greenhouse Gas Emissions and Climate Change Impacts* (2014), available at <http://www.whitehouse.gov/administration/eop/ceq/initiatives/nepa/ghg-guidance>.

<sup>15</sup> See 30 USC §207(a) (“A coal lease shall be for a term of twenty years and for so long thereafter as coal is produced annually in commercial quantities from that lease.”). See also 43 CFR 3475.2 (“Leases shall be issued for a period of 20 years and so long thereafter as the condition of continued operation is met. If the condition of continued operation is not met the lease shall be cancelled as provided in § 3452.2 of this title.”)

the 20-year period and every 10 years thereafter.<sup>16</sup>

The statute also directs BLM to collect three types of payment from leaseholders: the initial lease bid (or “bonus bid”), annual rent, and royalties on extracted coal. BLM has broad authority to set these payments. Bonus bids are set by the auction market, though BLM must reject any bid that does not reach its assessment of fair market value. Rental rates are left entirely to BLM discretion. The statute sets a general royalty floor of 12.5% for surface mines, but BLM is authorized to “waive, suspend, or reduce” royalties “for the purpose of encouraging the greatest ultimate recovery of coal”. The statute sets no ceiling on royalties. Royalties are to be charged “in such amount as [BLM] shall determine”, subject only to the soft 12.5% floor.<sup>17</sup>

Finally and separate from its directive to collect these three payments, BLM is given broad authority to impose lease terms. 30 USC §207(a) states that “[t]he lease shall include such other terms and conditions as the Secretary shall determine.”

#### 1.1.4 The Case for BLM Authority to Impose Environmental Charges in the Leasing Process

As an initial matter, statutory law does not preclude BLM from considering environmental impacts in coal leasing decisions. The statutory text detailing the leasing process itself gives little guidance on what factors may be considered in any of the three payments (aside from “fair market value” in bonus bids). But BLM’s general statutory directives not only permit consideration of environmental impacts in land use decisions, they require it. For example, 30 USC §201(a)(3)(C) states that

Prior to issuance of any coal lease, the Secretary shall consider effects which mining of the proposed lease might have on an impacted community or area, including, but not limited to, impacts on the environment, on agricultural and other economic activities, and on public services.

Other statutory language also requires BLM to consider environmental impacts. For example, 30 USC §201(a)(3)(E) requires all leases to include provisions requiring compliance with the Clean Air Act and Clean Water Act, and 30 USC §207(c) requires leaseholders, as a condition of their lease, to submit to “operation and reclamation plan” to BLM for approval before taking any action that may “cause a significant disturbance to the environment.” And, as noted above, the general principle of BLM management for multiple use is defined so as to encompass environmental values.

To be sure, none of these provisions directly states that BLM must, should, or even may consider environmental impacts in its determinations of lease-related bid payments, rents, and royalties. 30 USC §201(a)(3)(C), probably the strongest statutory directive to BLM regarding environmental impacts, applies specifically to the agency’s threshold leasing decisions, not its fee-setting powers.

But neither does the statute limit BLM’s authority to consider relevant factors, including environmental impacts, in setting fees. 30 USC §207(a) states that “The Secretary shall by regulation prescribe annual rentals on leases” and that “A lease shall require payment of a royalty in such amount as the Secretary [BLM] shall determine.” These provisions impose no restrictions on rental fees and none on royalties other than the above-noted 12.5% floor. Nothing in 30 USC §207 appears to limit agency authority to

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<sup>16</sup> See BLM Form 3400-12, *Coal Lease* (BLM’s standard coal lease form contract), which states “[this lease] is effective . . . or a period of 20 years and for so long thereafter as coal is produced in commercial quantities from the leased lands, *subject to readjustment of lease terms at the end of the 20th lease year and each 10-year period thereafter.*” (emphasis added).

<sup>17</sup> 30 USC §207(a)

increase rents or royalties on environmental grounds, at least for new leases. Even if authority to increase rents or royalties to include environmental charges cannot be found in the statute's delegation of authority to set these rates, the statute's *general* delegation of authority to "include such other terms and conditions" as BLM determines necessary may provide that authority. There are, however, some arguments (discussed in Section 1.1.5 below) that other statutory provisions limit BLM discretion in this regard.

Similarly, 30 USC §201 does not provide specific direction to BLM regarding the factors it may or may not consider in determining the "fair market value" (FMV) floor for auction bids. However, in this case the lack of such direction may not be sufficient to implicitly grant BLM authority to consider environmental impacts in the initial bidding process. Whatever "market" is being referenced, the term "fair market value" does not currently reflect the carbon externality associated with coal use. Therefore to the extent that FMV is interpreted to mean an approximation of the minimum value of a lease if it were offered in a competitive market (i.e. to many well-informed bidders), adding an environmental charge distorts that approximation. This remains true even though textbook environmental economics says that a well-functioning market for coal and coal leases depends on internalizing the associated environmental externality. Under this view, inserting a carbon charge into the calculation of FMV puts the cart before the horse – it is an attempt to achieve the desired policy outcome with a tool designed to reflect current market conditions. Current FMV calculations already reflect some environmental costs of coal since they depend on the market value of coal, which depends in part on fluctuations in demand as a result of EPA's downstream environmental regulations (as well as many other regulations, e.g., for worker safety).

Moreover, to the extent FMV reflects the effect on market value of considering additional regulations, it arguably should go *down*, not *up*. A charge reflecting some or all of the carbon externality associated with coal (whether imposed via greater royalties or a general carbon price) would depress the value of coal mining assets on federal lands. Nevertheless, what we term the external fair market value, i.e., the minimum bid the agency would accept for these resources accounting for the carbon externality, would go up.

To be sure, 30 USC §201 simply states that BLM must auction leases via a "competitive bidding process," with no restriction on agency authority to structure that process other than the requirement that winning bids meet FMV. BLM might therefore be able to impose a carbon-based minimum bid requirement over and above a current market-based FMV. However, there is no statutory basis for imposition of such a floor or for rejection of bids that meet an unadjusted FMV. Applying an SCC at the bidding stage requires either an addition to the elements that enter into FMV calculation (what we term the external FMV) or the introduction of a new charge beyond FMV, neither of which the statute contemplates. This stands in contrast to rent and royalty payments, which BLM is directed by statute to collect and is given broad discretion to set.

Even for rents and royalties, where its authority to set payment amounts seems to be broad, BLM's decisions are of course still constrained by the Administrative Procedure Act (APA) requirement that agency action not be "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law."<sup>18</sup> Increased lease fees based on environmental impacts would indeed be unprecedented – in fact, rental rates are set at a uniformly low level, and royalties rarely if ever exceed the statutory floor of 12.5%. But that, alone, is not strong evidence that new environmental charges would exceed BLM's authority. Given the clear directives to the agency in the statute to consider environmental impacts in the leasing decision and the explicit inclusion of environmental values in the general "multiple use" land-

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<sup>18</sup> 5 USC §706(2)(A)

management policy, it would likely be difficult to successfully argue that such a move would violate the APA standard – though see the next section for some more detailed counterarguments.

In other words, statutory law does not initially appear to restrict BLM from considering environmental impacts in the leasing process, including setting of rental and royalty rates. In fact, doing so is consistent with the general statutory directive that BLM manage lands “in a manner that will protect the quality of...environmental, air[,] and atmospheric...values.”<sup>19</sup>

#### 1.1.5 Counterarguments and Legal Risks

It is important to confront some counterarguments to the above conclusion that BLM’s governing statutes broadly grant it the authority to include environmental charges in coal leases. Litigation is certain if BLM were to adopt such a policy. Courts will therefore have to decide whether BLM has adequate statutory authority to support the actions it takes and, relatedly, whether those actions will survive scrutiny under the APA standard of review. Any attempt to impose environmental charges carries legal risk.

As we argue later, applying the SCC in current federal interagency use to BLM coal leasing would make coal extraction uneconomic on some or all unleased federal lands, and possibly some or all leased lands as those leases are subject to regular readjustment (20 years to start and 10 years thereafter). One argument against BLM authority is that this result is inconsistent with the “multiple use” and “sustained yield” land management principles set out in the statute. Multiple use, however, does not require BLM to allow *all* uses. The agency has authority to ban uses incompatible with competing uses or with the other principles (including environmental values) laid out in the statute.<sup>20</sup> If the authority to ban uses is consistent with “multiple use,” imposition of fees for such uses almost certainly is as well. This does not mean that the multiple use policy directive grants agency authority to impose fees, but rather that such fees, including additional environmental charges, are *not inconsistent* with multiple use. As detailed above, Congress has granted BLM authority to impose (indeed required it to impose) lease-related fees, and the provisions granting that authority are arguably sufficiently broad to give the agency authority to consider environmental impacts in setting those fees.

Moreover, “sustained yield” (which might otherwise be interpreted as requiring some level of extraction) is defined by the statute to apply only to *renewable* resources on federal lands (e.g. forest products), not nonrenewable resources like coal.<sup>21</sup>

A stronger argument is that the statute’s directive to manage public lands “in a manner which recognizes the Nation’s need for domestic sources of minerals” precludes a policy that would eliminate or substantially reduce coal extraction on those lands. Such an argument might resonate with a reviewing court (reviewing BLM action under the “arbitrary and capricious” standard mentioned above) if a policy involving environmental charges were, in effect, to completely eliminate coal extraction or reduce it to a *de minimis* level. Short of such a step however, a court would likely leave the interpretation and weighing of this directive to agency discretion.

<sup>19</sup> 43 USC §1701(a)(8)

<sup>20</sup> BLM could in fact argue that, even setting aside broader climate impacts on public health and welfare, GHG emissions from mined coal and resulting climate change is a sufficient threat to BLM lands themselves that coal extraction is an incompatible use. Since our object here is to assess the merits of carbon charges, not a command-and-control ban on extraction, we do not address the legal merits (much less the wisdom) of such a policy justification.

<sup>21</sup> See 43 USC 1702(h)

Another argument is that the stated goals in federal minerals policy of “development of economically sound and stable domestic mining” and “orderly and economic development of domestic mineral resources. . . to help assure satisfaction of industrial, security and environmental needs” supersede or at least must be weighed against any BLM policy which would substantially limit economic extraction of coal. However, the meaning of this language depends on the interpretation of “economically sound and stable”, “orderly” and “economic.” Coal production that would occur only if the negative impacts (externalities) of coal on public health and welfare were not taken into account is arguably not “economic” at all. “Economic” considerations need not be interpreted so as to exclude environmental impacts and values, whether measurable or not. Most environmental economists would argue that economic analysis of a project or action is incomplete to the extent that it fails to account for environmental impacts.

Even if “economic” in this context is interpreted to indicate Congressional intent that BLM balance “traditional” economic interests (that is, economic interests exclusive of environmental externalities) with environmental impacts, these provisions constitute a broad policy pronouncement that arguably creates no discernible or enforceable limit on agency authority. Even if they are interpreted to limit BLM authority, all they do is require the agency to balance these “economic” considerations with other concerns, including environmental impacts. It would likely be difficult to convince a court to overturn the agency’s judgment on this balancing outside of the boundary case noted above, in which coal extraction on federal lands is abruptly eliminated or reduced to extremely low levels.

Finally, 30 USC §201(a)(3)(C) might require the agency to consider economic impacts in its threshold lease decisions. In addition to the consideration of environmental impacts noted above, this section of the statute instructs BLM to:

...evaluate and compare the effects of recovering coal by deep mining, by surface mining, and by any other method to determine which method or methods or sequence of methods achieves the maximum economic recovery of the coal within the proposed leasing tract. This evaluation and comparison by the Secretary shall be in writing but shall not prohibit the issuance of a lease; however, no mining operating plan shall be approved which is not found to achieve the maximum economic recovery of the coal within the tract.

This language, however, is probably best interpreted to require BLM to consider “maximum economic recovery” in its approval of mining operation plans, with specific reference to the method of mining (deep or surface), rather than as a counterweight to the previously-stated consideration of environmental impacts. In other words, the statute directs BLM to consider environmental impacts when deciding whether to grant a lease, and then consider “maximum economic recovery” in reviewing the lessee’s plan for getting the coal out of the ground and to market.

Similarly, the statute gives the agency the authority to reduce royalty rates below 12.5% “for the purpose of encouraging the greatest ultimate recovery of coal. . . whenever in [its] judgment it is necessary to do so in order to promote development, or whenever. . . leases cannot be successfully operated under [their terms].”<sup>22</sup> This provision does clearly set maximization of extraction as a goal for the agency, but only in a limited context - the setting of royalty rates. In other words, BLM may decide not to make land available for coal leasing, to impose various restrictive lease terms, and/or, perhaps, to impose environmental charges, but if *royalty rates* make recovery uneconomic, then the agency *may* reduce those rates below the 12.5% floor. This language, therefore, does not necessarily indicate that

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<sup>22</sup> 30 USC §209.



the agency must consider “greatest ultimate recovery of coal” at any other point in its leasing policy process.

However, this narrowly targeted discretion falls at just the right point to perhaps undercut a policy aimed at internalizing coal’s carbon externality. If BLM were to generally increase royalty rates so as to reflect a social cost of carbon, but then liberally grant waivers reducing those royalties in cases in which that new, higher royalty impaired “greatest ultimate recovery”, then the exception could swallow the rule, leading to little or no change in coal extraction.<sup>23</sup>

Finally, as the above examples illustrate, although BLM’s authorizing statute contains no *general* directive to maximize recovery of coal, or, arguably to even balance extraction (or “sustained yield”) with environmental or other considerations, there is substantial language in various statutory provisions directing the agency to consider extraction in *specific* contexts. A court might therefore conclude that the statute implicitly if not explicitly indicates Congressional intent that the agency indeed balance environmental concerns with extractive uses. A court, moreover, need not go to such great interpretive lengths to reach such a conclusion - “multiple use” itself is defined so as to mean such balancing.

However, this alone does not limit agency authority to regulate uses, including the authority to impose fees on some uses. Courts are reluctant to interfere with agency decisions requiring exercise of the agency’s expertise, such as balancing multiple uses on federal lands. As noted above, it is possible that this reluctance might be set aside were the effects on coal leasing judged extreme, but short of that result an environmental charge on coal extraction appears unlikely to be sufficient to trigger such judicial scrutiny of agency decision making.

#### 1.1.6 Statutory Conclusions

In our view, the arguments against BLM authority to adjust coal leasing charges based on environmental impacts are somewhat weaker than arguments that BLM does have such authority under current statutory law. More broadly, it is likely that the political limits on BLM’s ability to exercise this authority are more significant than the legal limits. The legal arguments against BLM environmental charges are strongest if such charges result in a complete or at least very large abrupt reduction in coal extraction from federal lands. Even if BLM were to consider such an action, there are arguably no legal restrictions on its authority to do so in the statutory provisions governing coal leasing. The strongest legal arguments for limitations on BLM authority derive from the statute’s general requirement that the agency balance “multiple uses” on federal lands. For a court to overturn agency action on these grounds requires it to conclude that the agency has exceeded its delegated discretion and violated APA standards – a high bar.

### 1.2 BLM’s Regulatory Authority

As discussed above, BLM has broad authority to structure the coal leasing process on federal lands. Its regulations control the initial bidding process along with rates and payment of rents and royalties. In principle, an environmental charge could be incorporated into any of these three payments (see Section 3.2.3, below, for a discussion of the relative merits of each as a vehicle for such charges). In this section,

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<sup>23</sup> Indeed the waiver provision seems to contradict itself. Any royalty payment impairs the “greatest ultimate recovery of coal” since production would almost always be greater if royalties were lower or zero.

we will consider BLM’s relevant regulations for each payment in turn, and identify changes that could be made to incorporate environmental impact charges. Any of these changes to BLM’s implementing regulations would be subject to the standard notice-and-comment rulemaking process.

It might be legally permissible for BLM to adopt environmental charges in individual lease contracts (via adjustments made after 10- or 20-year contract periods), rather than its general regulations, but doing so would not create a uniform, consistent policy that addresses widespread climate externalities from coal extraction.

### 1.2.1 The Bidding Process

Both statutory law and BLM’s implementing regulations generally require federal coal leases to be offered on a competitive basis. Since 1990, leasing by application, in which companies nominate tracts of land to be leased, has been the predominant method of coal leasing.

Once a particular parcel has been nominated for leasing, BLM first determines whether the land should in fact be leased (this determination is part of BLM’s planning process and is discussed in Box 3). If the land is to be made available for leasing, BLM then computes an FMV for the lease, based in part on production estimates provided in the leasing application. This FMV calculation is kept secret. Bidding parties submit bids to BLM, and the lease is awarded to the “qualified company” with the highest bid that exceeds the FMV. This bid or “bonus” is paid over the first five years of the lease. In practice, most lease auctions have but one bidder, raising the obvious issue of a lack of competitiveness.<sup>24</sup>

BLM’s regulations at 43 CFR § 3422.1(c)(1) implement the statutory direction that no bonus bid be accepted for a coal lease unless it meets the FMV. 3 CFR § 3422.1(c)(2) further states that the minimum FMV for a lease is \$100 per acre or its equivalent in cents per ton. BLM’s detailed policies for estimating FMV for a lease are contained in *Handbook H-3073-1 – Coal Evaluation*. This handbook incorporates the definition of FMV from another policy document, the *Uniform Appraisal Standards for Federal Land Acquisitions*:

Fair market value means that amount in cash, or on terms reasonably equivalent to cash, for which in all probability the coal deposit would be sold or leased by a knowledgeable owner willing but not obligated to sell or lease to a knowledgeable purchaser who desires but is not obligated to buy or lease.

The handbook further outlines two methodologies for computing the FMV: the comparable sales approach (in which sale prices from similar properties in prior transactions are used to determine value) and the income approach (in which an estimate of annual costs and revenues is used to determine value).<sup>25</sup> The FMV process for each tract to be leased is open to public comment.

BLM’s valuation process is complex, and space here permits only a general overview of how environmental charges might be integrated into that process. Moreover, as noted above, arguments in favor of BLM’s statutory authority to do so are much weaker than for rent and royalty payments.

In principle, BLM would have to define a new term – the external FMV noted above – that incorporated the FMV defined in the Handbook plus the present discounted value of the SCC embodied in an estimate of coal production from the lease in auction. While BLM does have discretion to determine how FMV is calculated, as noted above such fundamental revision of the concept may exceed its authority.

### 1.2.2 Rents

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<sup>24</sup> GAO 2014, Figure 3

<sup>25</sup> See BLM Handbook H-3073 (2014) at 4-1 et seq.

BLM has set minimum rental rates for all lands leased for coal extraction at \$3.00 per acre.<sup>26</sup> The result is that rental income accounts for only 0.1% of the annual revenue from federal coal leases.<sup>27</sup> However, as discussed above, BLM has broad statutory authority to increase rental rates.

Assuming this legal authority is sufficient to allow imposition of environmental charges, the agency could do so by modifying its regulations at 43 CFR §3473 in either of two ways. Either the agency could increase the minimum rent to reflect some average estimation of environmental impacts of extracted coal per acre, or it could create a case-by-case review process under which rental rates are set at a level that reflects impacts of extracting, processing and/or burning the coal extracted from the specific lands to be leased. As discussed below, this process could be relatively simple and easy to administer, but would be difficult to calibrate to the specific externality associated with each lease as it would require a good up-front production estimate to connect the carbon charge to the actual volume of extracted coal.<sup>28</sup>

### 1.2.3 Royalties

As noted above, the royalty rate for surface-mined coal is required by statute to be at least 12.5%.<sup>29</sup> This floor is restated in BLM's implementing regulations at 43 CFR § 3473.3–2(a)(1). The statute and implementing regulations allow lower royalty rates for subsurface mining or “when necessary to promote development” – the floor, in other words, is not firm. The agency indicates that royalties may be reduced to as low as 2%, but regulations prohibit them from being reduced to zero.

The effective average royalty rate (the rate actually paid after rate reductions and allowable deductions) has been approximately 11% since 1990.<sup>30</sup> The majority of the revenue from federal coal leases comes from royalties (almost two-thirds of the revenue from 2003-2012).<sup>31</sup> In practice, BLM rarely if ever charges royalty rates above 12.5%. But, as discussed above, it has broad authority to do so, arguably on environmental grounds.

The most straightforward method for imposing a charge on extracted coal aimed at partially or completely internalizing the carbon externality is to increase the royalty rate by a set social cost of carbon per ton multiplied by the carbon content of the extracted coal. For example, 43 CFR §3473.3-1(a) could be amended to read:

A lease shall require payment of a royalty of not less than 12 1/2 percent of the value of the coal removed from a surface mine plus the carbon content of the coal times the designated social cost of carbon per ton of CO<sub>2</sub>, as defined elsewhere in these regulations, per metric ton of coal extracted.<sup>32</sup>

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<sup>26</sup> 43 CFR § 3473.3–1(a)

<sup>27</sup> GAO 2014, p. 27

<sup>28</sup> It might be possible to specify in lease terms that annual rental rates will be based to some extent on past year's production, rather than an initial estimate.

<sup>29</sup> 30 USC § 207(a) a

<sup>30</sup> GAO 2014, p. 24

<sup>31</sup> *Id.*, p. 23

<sup>32</sup> We take no position on the appropriate size of the SCC that should be imposed on extracted coal. If the IWG's estimate is imposed, for sub-bituminous coal like that produced from federal lands in Wyoming, the value is approximately 1.8 times the SCC per ton of coal, since every ton of extracted sub-bituminous coal generates approximately 1.8 tons of CO<sub>2</sub>. See EPA, *Unit Conversions, Emissions Factors, and Other Reference Data* (2004) at 2, available at <http://www.epa.gov/cpd/pdf/brochure.pdf>.

#### 1.2.4 New and Existing Leases

Whichever method (if any) BLM chooses for incorporating a carbon-related charge into the leasing process, it would not immediately apply to all leases. Lease terms are set when the lease is initially signed, and are subject to readjustment (as noted above) after 20 years, and every 10 years thereafter. For areas already subject to existing leases, therefore, carbon-related charges would be applied as leases come up for readjustment. Only for new leases would such charges apply immediately. As noted below, new or renewed leases in any given year are a small fraction of all coal under lease.

#### 1.2.5 Regulatory Conclusions

Assuming that BLM has the requisite legal authority to impose environmental charges on rents and/or royalties, the changes to its implementing regulations necessary to do so would be relatively minor. Just as is the case with the governing statutory text, BLM's implementing regulations are quite general, with the specifics of lease terms left to case-by-case determination. This could remain the case even if environmental charges are imposed – BLM could simply raise the floor it specifies for one of these payments, or indicate that case-by-case fee determinations are to include adjustments based on estimated social cost of carbon. In contrast to rents and royalties, however, imposing environmental charges on bonus bids would likely require major changes in how BLM does business and even need statutory change.

Any of the changes would likely requiring notice-and-comment rulemaking, are likely to be contentious, and are likely to be followed by litigation. But the actual changes to BLM regulations would be relatively small.

#### **Box 1:** Coal Leasing in Alberta, Canada

To add insight to the scope for addressing the social cost of carbon at the minemouth, we investigated the coal leasing system in Alberta, Canada. Unlike the U.S., the provinces in Canada own most of the coal resources. Among these provinces, the province of Alberta holds 70 per cent of Canada's coal reserves, the Albertan government owns almost all the coal resources within its borders, and in 2013 Alberta's coal production amounted to 34.5 million tons (Alberta Energy 2015a). Alberta's Coal and Mineral Development Unit from the Department of Energy is the legal authority responsible for issuing and administering agreements for exploration and production of Alberta-owned coal (which is most of the coal producing lands in Alberta), and the Alberta Environment and Sustainable Resource Development reviews coal development applications on provincial public lands (Alberta Environment and Sustainable Resource Development January 2015). Coal leases are governed by the following provincial legislation: Mines and Minerals Act (parts 2 and 3), Mines and Minerals Administration Regulation, Coal Conservation Act and Regulation, Coal Royalty Regulation, Freehold Mineral Rights Tax Act, the 1976 Coal Development Policy for Alberta, Environmental Protection and Enhancement Act, and Environmental Assessment (Mandatory and Exempted Activities) Regulation<sup>33, 34</sup>. In Alberta, as of January 1, 2015 there were 1,232 coal leases covering over 661,403 acres (Alberta Energy January 2015a).

In addition to the considerations for prohibition and restrictions on exploration and development in

<sup>33</sup> All mentioned Consolidated Statutes and Regulations of Alberta can be found at Canadian Legal Information Institute (CanLII) at <https://www.canlii.org/en/ab/laws/>

<sup>34</sup> Other relevant legislation includes Forest and Prairie Protection Act, Law of Property Act, Historical Resources Act, Municipal Government Act, Occupational Health and Safety Act, Public Lands Act, Special Areas Act, Surface Rights Act and Water Act, also available at CanLII at <https://www.canlii.org/en/ab/laws/>.

Alberta, the Coal Conservation Rules, among its various mandates, requires control of pollution and ensures environmental conservation in coal mining activities. As just one example, Section 3(e) of the Coal Conservation Rules states that any application to explore for coal shall include “a description of the measures the applicant takes to remedy or modify the potential impact of the proposed program on the environment, and to control pollution.”<sup>35</sup> Lessees are required to present documentation that outlines measures to be taken to remedy or modify potential environmental impacts and to control pollution. However, the Coal Conservation Rules stop short in outlining what are the required measurements to ensure environmental protection, as it focuses primarily on limiting the amount of loss or reduced recovery of coal during mining operations.

Environmental protection lies under the jurisdiction of the Ministry of Environment and Sustainable Resource Development, specifically governed by the Environmental Protection and Enhancement Act and the Conservation and Reclamation Regulation. The purpose of the Act is to ensure environmental protection while securing Alberta’s economic growth and prosperity in a sustainable manner, and applies to energy resource activities in the province.<sup>36</sup> Within the Act’s jurisdiction is the Environmental Protection and Enhancement Fund, a funding mechanism geared toward environmental protection and enhancement and emergencies.<sup>37</sup>

Under the Act an environmental assessment is required depending on the type of activity and the area where mining will take place. Where one is required, the environmental assessment report should include description of the activity, analysis of the site selection, identification of existing environmental baselines, description of potential positive and negative environmental, social, economic and cultural impacts of the activity, analysis of the potential impacts, plans designed to mitigate negative impacts, issues related to human health, consideration of alternatives to the proposed activity, monitoring of environmental impacts, contingencies plans, plans to implement waste minimization and recycling as well as minimization of harmful substances, and plans for public consultation.<sup>38</sup> This process seems very similar to NEPA in the U.S.

In terms of climate change, the Act makes reference to the powers of the Lieutenant Governor in Council to make regulations concerning CO<sub>2</sub> emissions and emissions credit system operating in Alberta. However, in terms of considering damages the Act only requires consideration of local environmental impacts, although it does require GHG emissions monitoring. Nevertheless, parameters on environmental impacts already exist and could be amended to more explicitly address climate change emissions and impacts.

Coal companies pay bonus bids, rents and royalties, as in the U.S., although there are some differences in the two systems that might be instructive in the context of applying a social cost of carbon. First, coal lease terms differ. Coal leases are renewable after 15 years, whereas in the U.S., the usual term is 20 years to start and 10 years thereafter (Alberta Energy January 2015b). Second, a major difference with the U.S. system is that under the Coal Royalty Guidelines, royalties are divided into royalties for subbituminous (electric power) and bituminous coal (exports for electric power generation and steel making), defined by their coal quality attributes (Alberta Energy 1993). In the U.S., no such distinction is made. A third difference is the rate itself. Royalties are CAD\$0.55 per ton for subbituminous coal and for bituminous coal, after the mine begins operation, 1% of mine mouth revenue plus 13% of net revenue” (Alberta Energy 2015b). This contrasts with the U.S. which varies royalties by whether the coal

<sup>35</sup> *Coal Conservation Rules*, RRA 2014, Reg 140 ss 3(d),(e),(i),(ii), 4(1)(d),(i),(ii), 14(1)(j), 19(2)(e), 26.

<sup>36</sup> *Environmental Protection and Enhancement Act*, RSA 2000, c E-12 ss 2(b), 2.1.

<sup>37</sup> *Environmental Protection and Enhancement Act*, RSA 2000, c E-12 s 30(2).

<sup>38</sup> *Environmental Protection and Enhancement Act*, RSA 2000, c E-12 s 49.

is surface mined (12.5% of net revenue) or deep mined (8% of net revenue).<sup>39</sup>

Indeed, because CO<sub>2</sub> emissions from new coal-fired electric utility plants are already regulated at the federal level (similar to the proposed US EPA regulation 111(b)), emissions charges on leases would be at least partly redundant. Further, Alberta already has a \$15/ton carbon price on industrial sources emitting over 100,000 tons CO<sub>2</sub> per year, which could internalize some non-utility uses of coal (this only comes into effect for emissions over a facility's allotment). Thus, as in the U.S., these climate change internalization policies could be seen as at least partly redundant to an SCC applied at the coal mine. That said, there is nothing preventing Alberta from switching from carbon pricing to a charge on leasing, or justifying an SCC at the coal mine to further internalize climate damages.

END BOX 1

## 2. The Social Cost of Carbon

Given that our legal analysis shows that BLM likely has the legal authority, with many caveats and uncertainties, to internalize CO<sub>2</sub>-related externalities through a tax or fee applied at various steps in its coal leasing operations, we now turn to examine issues specific to the social cost of carbon (SCC), whose value is the representation of such a tax or fee.

### 2.1 Background

The “social cost of carbon” refers to net global damages attributable to the effects of an additional unit of carbon dioxide emissions. These damages may be manifested physically as reductions or degradation in agricultural productivity and the quality of environmental resources, direct and indirect effects on human health and productivity, and other effects (as well as enhancements; hence the use of the term “net” global damages). Procedurally, the estimation of the SCC involves: assembling scientific information about physical damages, monetizing these physical damages using a set of integrated assessment models, and specifying net present values for the SCC. It is imperative to note that any such estimates are the result of specific assumptions (e.g. the rate of time preference), omits some important damages (e.g. ocean acidification), and as has so far been developed, would not accurately predict the impact of emissions of non-CO<sub>2</sub> gases (even once they have been converted into CO<sub>2</sub>-equivalence units). For these and other reasons, the SCC is usually expressed as a range of values, and is also expected to be updated over time as uncertainties are reduced and better analyses are conducted.

### 2.2 Defining and Producing the SCC by the Interagency Working Group (IWG)

The 2010 IWG report defines the SCC as “an estimate of the monetized damages associated with an incremental increase in the carbon emissions in a given year. It is intended to include (but is not limited to) changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services” (US Interagency Working Group 2010, p. 2).

The dollar estimates of the SCC produced by the IWG are shown in Table 1. There are three critical determinants of the dollar magnitudes in the table. The first two – the future years selected for

<sup>39</sup> 30 CFR 1206.257. However, the question of arms-length and non-arms-length contracts between companies as a form of lowering royalty rates has been a subject of discussion in the export valuation debate in the US. See Humphries and Sherlock 2013, pp. 15-16.

estimation and the rates of discount chosen to be able to express the SCC in present-value terms – are apparent from the table. The third – that they reflect global, not just U.S. domestic damages – is not. Box 2 covers a fourth issue – how non-CO<sub>2</sub> gases are treated.

**Table 1.** Social Cost Per Ton of CO<sub>2</sub> Emitted – 2015-2050 at Different Discount Rates in 2011\$<sup>40</sup>

<u>Year</u>	<u>5% Average</u>	<u>3% Average</u>	<u>2.5% Average</u>	<u>3% 95<sup>th</sup> Percentile</u>
2015	\$12	\$39	\$61	\$116
2020	13	46	68	137
2030	17	55	80	170
2040	22	65	92	204
2050	28	76	104	235

## BOX 2. Non-CO<sub>2</sub> Greenhouse Gases in the Social Cost of Carbon

It is important to note that the IWG numbers apply only to CO<sub>2</sub>, not all greenhouse gases. Important differences in atmospheric lifetime and radiative forcing between, say, methane (CH<sub>4</sub>) and carbon dioxide (CO<sub>2</sub>) make it inappropriate to assume that the social cost of carbon (dioxide) can be used with other gases expressed in CO<sub>2</sub>-equivalence terms, as it has been shown that this method underestimates the benefits of mitigating non-CO<sub>2</sub> gases (Marten and Newbold 2012; Marten et al. 2014). While this issue has been known since the 1990s (see, e.g., Schmalensee 1993 and Fankhauser 1994) and social cost estimates for non-CO<sub>2</sub> gases were identified as an area for further research in the 2010 IWG report (p. 12), the IWG did not present any such social cost estimates in its 2013 report. As a result, how federal agencies should value the damages from non-CO<sub>2</sub> gases remains unclear. Two economists with the EPA's National Center for Environmental Economics, however, have provided (in an unofficial capacity) social cost estimates for methane "based on assumptions similar to those used by the [IWG]" (Marten and Newbold 2012). They find that using a social cost of carbon and CO<sub>2</sub>-equivalence, rather than developing social cost estimates for each individual GHG, can "underestimate the benefits of current CH<sub>4</sub> emissions by up to 35%...." We present their estimates of the social cost of methane in Table 2.

**Table 2.** Social Cost Per Ton of CH<sub>4</sub> Emitted – 2015-2050 at Different Discount Rates in 2011\$<sup>41</sup>

<u>Year</u>	<u>5% Average</u>	<u>3% Average</u>	<u>2.5% Average</u>
2015	\$488	\$1052	\$1410
2020	597	1193	1627
2030	868	1736	2170

<sup>40</sup> These numbers are EPA updates of the IWG estimates. The EPA estimates are presented in 2011 dollars, rather than 2007 dollars as is done in both the February 2010 and May 2013 IWG reports. The updated estimates were used by the EPA in its Regulatory Impact Analysis for the Clean Power Plan (see page ES-3 of that document). Throughout the report we will refer to the EPA estimates, particularly the \$46/ton estimate representing the 3% average discount rate for the year 2020. For the EPA Fact Sheet with the updated estimates, see: [www.epa.gov/climatechange/Downloads/EPAactivities/scc-fact-sheet.pdf](http://www.epa.gov/climatechange/Downloads/EPAactivities/scc-fact-sheet.pdf)

<sup>41</sup> Source: Marten and Newbold 2012. Originally reported in 2007\$

2040	1193	2278	2929
2050	1627	3146	3797

The issue of the applicability of the social cost of carbon to methane emissions is relevant to the policy question at hand of how to best internalize climate damages from the BLM coal leasing program. As discussed later in Section 3, most of the greenhouse gas emissions from the federal coal lifecycle prior to combustion are methane emissions, not carbon dioxide. Additionally, it is these upstream methane emissions at the mine that would not be internalized by the proposed Clean Power Plan. Nevertheless, these emissions are relatively small (even corrected for their greater global warming potential) compared to CO<sub>2</sub> emissions from burning.

END BOX 2.

### 2.2.1 How Far Into the Future? At What Rates of Discount?

That annual SCC estimates shown in Table 1 increase steadily reflects the fact that a deferred onset of carbon mitigation strategies inescapably means the likelihood of worsening conditions as time goes by. Thus, incremental damage associated with an added ton of CO<sub>2</sub> to prevailing emissions points to an estimated SCC of \$39 and \$46 per ton for the years 2015 and 2020 respectively in present value terms using a 3% discount rate. Those figures rise to \$76 per ton in 2050.

As in commercial and financial-sector transactions, where discount rates reflect the estimated time value of money and uncertainty, their use in the economics of climate change compels us to assess how the prospect of future costs to society of climate-change impacts should drive anticipatory measures to manage those costs. Thus, even if values close to market rates satisfy conventional business planning, the unique and highly uncertain risks associated with climate change present a far more complex challenge. Ultimately, these challenges led the IWG to use multiple discount rates, both because the SCC calculations are very sensitive to choice of rate and because there is no consensus on the “correct” rate.

As each of the three columns of Table 1 shows, a stream of damages in which long-term future impacts are discounted heavily (5% per year) produces a present-day equivalent cost of damages incurred by mid-century that is relatively low (\$28); an only modestly discounted future (2.5%) produces a high present value (\$104). Between these outer calculations, it is relatively common practice in cost-benefit analyses to select the mid-range rate of 3%, which, by 2020, is estimated at a present value of \$46. If extreme economic impacts from climate change are experienced – those represented by the 95<sup>th</sup> percentile in the models – then with a 3% discount rate in 2020, the SCC is estimated by EPA using the IWG report to be \$137, significantly higher than the \$46 average estimate. The IWG did not provide a 5<sup>th</sup> percentile estimate.

### 2.2.2 Use of the SCC in the Federal Government

Our take-off point here is the SCC’s development and use for regulatory purposes by the U.S. federal government. The SCC’s adoption by the government owes its emergence to Executive Order 12866, a 1993 directive that obliged federal agencies to assess the estimated benefits and costs of consequential



regulatory actions. In 2003, OMB's Circular A-4 fleshed out that Executive Order by assisting agencies in "defining good regulatory analysis and standardizing the way benefits of federal regulatory actions are measured and reported" (OMB 2003). Monetization was expected to be part of that process.

The SCC's role within that more general process dates from 2009 when OMB's Office of Information and Regulatory Affairs (OIRA) and the Council of Economic Advisers (CEA) convened an Interagency Working Group on the Social Cost of Carbon (IWG), an effort by leading economists, risk analysts, and climate experts to evaluate a set of major global economy-climate models and projections; and, on the basis of such evaluation, render a collective judgment about the range of SCC values that could be used uniformly across federal agencies in their Regulatory Impact Assessments. This limited use envisioned for the SCC is important when considering its use in an operational context by BLM. Such expanded use would significantly expand its reach and the consequences to economic actors affected by BLM leasing decisions.

That said, the SCC has emerged as an increasingly-referenced tool of analysis in federal regulatory impact analyses. The most visible and widely-discussed agency use of the SCC as a significant factor in a proposed rulemaking process is in EPA's Clean Power Plan. But an exhaustive compilation by the US GAO, covering the period 2008-2014, provides additional detail on federal agency SCC reliance beyond its consideration by EPA. GAO reports the use of an SCC estimate in 58 proposed or final rules and identifies DOE, EPA, and DOT as the leading SCC-using agencies, with DOE making up 14 of the 16 total agency citations of the 2013 IWG estimates (GAO 2014, Appendix I). No part of this record should be read as pointing to the SCC as a core and decisive factor in proposed or adopted rules. But its growing place in agency regulatory impact analyses shows that it is becoming the standard vetted referent for federal evaluation of greenhouse gas emission policies.

### 2.2.3 Other Estimates of the SCC

There are two other sources of social cost of carbon estimates worth noting. The first emerges from what may be called the compliance cost approach; the second is its use by private companies for investment planning purposes.

The compliance cost approach would peg the SCC at the amount of costs the government is willing to impose on the economy to bring down the expected damages from greenhouse gas emissions. This type of measure has the advantage of avoiding the use of damage estimates, which are far more controversial than compliance costs. In this spirit, the costs per ton of reducing CO<sub>2</sub> emissions in the Clean Power Plan are about \$14 (from dividing the present discounted value of compliance costs by total CO<sub>2</sub> reductions), against \$40 and up for the damages. Nevertheless, this approach has the disadvantage of being a lower bound estimate of damages, in the sense that a government will not want to impose compliance costs unless they are exceeded by the damages avoided.

Private-sector use of the SCC appears to be growing, albeit in a much more limited and less publicized fashion. This growing use should not be surprising as firms feel more exposed to the regulatory risk of future climate change legislation and regulation. The social cost of carbon (termed a carbon "price" in this context) is used for investment planning as well as in evaluation of fossil fuel resource stocks.

For now, there is no systematic tabulation of data that would indicate the number and industrial classification of firms using carbon prices, the values chosen, and their role – casual or integral – in their long-term planning and resource valuation strategies. However, a non-governmental organization (CDP) has recently surveyed a sampling of companies worldwide with a view to getting at this issue in some depth (CDP 2014). For the U.S., their survey lists 10 companies "that disclose an internal price on

carbon” as shown below in table 3.

**Table 3:** Internal Carbon Price at Select U.S. Companies

Firm	Carbon Price
Walt Disney Company	\$10-20
Mars	20-30
ConocoPhillips	8-46
Encana Corporation	10-80
ExxonMobil Corporation	60-80
Devon Energy Corporation	15
Google Inc.	14
Microsoft Corporation	8-7
Ameren Corporation	30
Excel Energy Inc.	20

We also note that pressure on private companies to account for climate change in reporting is also coming from the government. The Securities and Exchange Commission has issued interpretive guidance on disclosure related to the effects of climate change and related public policy on business assets and operations, as well as legal developments, pertinent to the company. (see <http://www.sec.gov/rules/interp/2010/33-9106.pdf>).

### 2.3 Global versus Domestic SCC

The rapid atmospheric mixing of CO<sub>2</sub> – it respects no geopolitical boundaries – argues on the one hand for a SCC reflecting global damages. Indeed, the IWG’s SCC is defined to be a global SCC. As the 2010 IWG states, beginning on page ten:

[...T]he climate change problem is highly unusual in at least two respects. First, it involves a global externality: emissions of most greenhouse gases contribute to damages around the world even when they are emitted in the United States. Consequently, to address the global nature of the problem the SCC must incorporate the full (global) damages caused by GHG emissions. Second, climate change presents a problem that the United States alone cannot solve. Even if the United States were to reduce its greenhouse gas emissions to zero, that step would be far from enough to avoid substantial climate change. Other countries would also need to take action to reduce emissions if significant changes in the global climate are to be avoided.

In the light of such considerations, the interagency group embraced the logic justifying a global measure of the benefits from reducing US emissions, and re-affirmed this position in the 2013 update (IWG 2013, 14-15).

Not all agree with this position and in fact, guidelines from the U.S. Office of Management and Budget typically limit regulatory cost and benefit rulemaking as follows (see OMB 2003, Circular A-4, 8): “[Agency] analysis should focus on benefits and costs that accrue to citizens of the United States. Where you choose to evaluate a regulation that is likely to have effects beyond the borders of the United States, these effects should be reported separately.” Using only the domestic portion of the SCC rather than the global SCC makes a marked difference; the 2010 IWG report does not give specific domestic SCC values, but suggests that they should be calculated at 7-23% of the global figure while

noting that these values are “approximate, provisional, and highly speculative” and depend on key assumptions (IWG 2010, 11).<sup>42</sup>

## 2.4 Conclusions on the SCC

Four issues arise with respect to choosing an SCC for use in BLM’s coal leasing program. The first is the wide range of uncertainties associated with the appropriate value. These uncertainties – in discount rates, in the “routine” damages within various sectors as calculated by the integrated assessment models reviewed, and in the handling of catastrophic damages, to name a few – are addressed to a reasonable extent by the IWG report, although controversies remain. The second is that the IWG effort was geared from the outset to develop an SCC for use in Regulatory Impact Analyses, i.e., the cost-benefit analyses that are required by OMB to be conducted for all major federal regulatory activities, and were recently proposed for use in NEPA planning documents. By inference, they were not developed to be used directly in agency operational decisions, such as leasing. Presumably, their use in this manner would require further discussions and analyses. The third is whether the SCC used for coal leasing should capture global or domestic damages. This controversial choice (with OMB and IWG at odds) could have dramatic implications for the SCC. And, the fourth is how the SCC should be altered to account for multiple gases, specifically fugitive methane emissions from coal mining. Given these issues, there are serious questions about using the SCC taken from the IWG reports and used in RIAs in the context of BLM coal leasing decisions.

## 3. Economic Issues

In this section we first cover background information on the coal sector and the role of federal lands. Then we discuss economic implications of various approaches to accounting for global climate change in BLM activities. Unlike the legal analysis, we briefly consider implications of incorporating the SCC in pre-lease planning and decision-making in Box 3.

### 3.1 Background

The U.S. has the world’s largest coal reserves and produces around a billion metric tons of coal annually, of which 12% was exported in 2012 and the rest consumed domestically (EIA 2013, *Annual Coal Report 2012*; EIA 2014, *Quarterly Coal Report*, Table 4). The share of coal exports has been rising in the face of rising international demand and falling domestic demand as a result of cheaper natural gas, retiring coal plants and now the prospective Clean Power Plan. Considering all fuel stocks and energy uses (including transportation), coal is the third largest source of energy consumed in the US at 18.2%, with petroleum supplying 36.4% and natural gas supplying 27.4% (EPA 2014, *US Greenhouse Gas Inventory 1990-2012*, Figure 3-3). Again considering all fuel stocks and energy uses, coal is the second largest source of CO<sub>2</sub> emissions from fossil fuel combustion (*id.*, Table 3-5). Although coal use as an electric fuel stock has been declining in the U.S., it still accounts for 39% of U.S. electricity generation and electric power generation remains the primary use (93%) of coal consumed in the U.S. (EIA 2014, *Energy in Brief*). While coal only supplies 39% of electricity generation, it accounts for 75% of CO<sub>2</sub> emissions from electricity generation (EPA 2014, *US Greenhouse Gas Inventory 1990-2012*, Table 3-5). While coal use

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<sup>42</sup> For instance, for a 3% discount rate they estimate the domestic benefit share at 10% according to the models analyzed which would, using the \$46/ton global figure in Table 1, yield an estimate of domestic effects of \$4.60/ton CO<sub>2</sub>. Alternatively, if one were assuming that the domestic benefit matched the U.S. share of global GDP, a rate of 23% would be used, yielding an estimate of domestic effects of \$10.58/ton CO<sub>2</sub>.

downstream – in combustion for electricity generation and iron and steel production – constitutes most of coal’s domestic GHG emissions, some emissions are produced upstream at the mining stage itself (see Table 3).

**Table 3:** Domestic Greenhouse Gas Emissions from Coal (Tg CO<sub>2</sub>e), 2012<sup>43</sup>

Combustion		
	Commercial	4.1
	Industrial	74.3
	Electricity Generation	1,511.2
	<b>Total Combustion</b>	<b>1,593</b>
Mining		
	Coal Mining	55.8
	Abandoned Underground Mines	4.7
	<b>Total Mining</b>	<b>60.5</b>
Other	Iron and Steel Production & Metallurgical Coke Production	<b>54.9</b>
<b>Total</b>		<b>1708.3</b>

Coal is divided into four major ranks – lignite, sub-bituminous, bituminous, and anthracite – with varying heat and sulfur content across these ranks and across specific coal deposits. The two primary ranks of coal produced in the United States are bituminous (48%) and subbituminous (44%); the former is found primarily east of the Mississippi River and the latter west of the Mississippi River (EIA 2012, *Coal Explained*). Coal can further be grouped by end use – metallurgical coal for use in industrial processes and steam or thermal coal for electric power generation. Subbituminous and bituminous coal are both used for electric power generation, and EPA notes that most of the subbituminous coal used for electric power generation in the US comes from the Powder River Basin (PRB) (EPA 2010, Exhibit 2-1). Summaries of coal production and quality for three of the 14 coal supply regions from EIA’s Coal Market Module are presented in table 4.<sup>44</sup> These three permit a comparison among a basin with dominant federal ownership (PRB), mixed ownership (Rocky Mountain) and non-federal dominance (Central Appalachia) as well as between different ranks of coal.

**Table 4:** Coal production and characteristics for three regions<sup>45</sup>

Coal Supply Region	States	Coal Rank and Sulfur Level	Mine Type	2012 Production (million short tons)	Heat Content (million BTU/short ton)	Sulfur Content (lbs/million BTU)	Mercury Content (lbs/trillion BTU)	CO <sub>2</sub> (lbs/million BTU)
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<sup>43</sup> Source: EPA 2014, *US Greenhouse Gas Inventory 1990-2012*, Table 3-5 and Table ES-2.

<sup>44</sup> For an illustration of the type and characteristics of coal produced by region, consult either the EIA Annual Coal Report, the International Energy Agency Coal Information Report, or the Coal Market Module in the Assumptions to the Annual Energy Outlook 2014. The Coal Market Module classifies 14 coal supply regions according to state, coal rank, heat content, and various emission factors.

<sup>45</sup> Source: EIA 2014, *Assumptions to the Annual Energy Outlook 2014*, Table 12.5

Central Appalachia	KY (east), WV (south), VA, TN (north)	Metallurgical	Underground	54.9	26.30	0.62	N/A	206.4
		Low-Sulfur	All	10.2	24.72	0.54	5.61	206.4
		Bituminous	All	82.8	24.66	0.95	7.58	206.4
Wyoming, Southern PRB	WY (southern PRB)	Low-Sulfur Subbituminous	Surface	235.0	17.63	0.28	5.22	214.3
Rocky Mountain	CO, UT	Metallurgical	Underground	0.1	26.30	0.43	N/A	209.6
		Low-Sulfur	Underground	40.0	22.74	0.51	3.82	209.6
		Bituminous	Surface	5.5	19.93	0.51	2.04	212.8

This heterogeneity in coal quality and characteristics is reflected in coal prices, which are by far the lowest for PRB coal, as shown in Table 5.

**Table 5:** Average coal commodity spot prices (\$/short ton)<sup>46</sup>

Central Appalachia 12,500 BTU 1.2 SO <sub>2</sub>	Northern Appalachia 13,000 BTU <3.0 SO <sub>2</sub>	Illinois Basin 11,800 BTU 5.0 SO <sub>2</sub>	Powder River Basin 8,800 BTU 0.8 SO <sub>2</sub>	Uinta Basin 11,700 BTU 0.8 SO <sub>2</sub>
\$53.06	63.15	45.32	11.55	38.13

The average price by end use also varies, as shown below.<sup>47</sup> The cheapest coal price is for electric power, although this price is 50% higher when the (steam) coal is exported.

**Table 6:** Average prices (\$/short ton) by end use<sup>48</sup>

Electric Power	Coke	Commercial and Industrial	Export – Steam	Export –Metallurgical
45.77	190.55	90.76	69.54	101.31

<sup>46</sup> For the week ending January 9<sup>th</sup>, 2015. Source: EIA 2015, Coal News and Markets, Available at [http://www.eia.gov/coal/news\\_markets/](http://www.eia.gov/coal/news_markets/)

<sup>47</sup> When evaluating coal sale prices against the SCC, note the difference in short tons versus metric tons. Most coal statistics from the EIA and other sources are reported in short tons, whereas the SCC is presented as the cost per metric ton of CO<sub>2</sub>. 1 short ton is approximately 0.907 metric tons.

<sup>48</sup> Electric Power, Coke, and Commercial and Industrial are for 2012 all from EIA Annual Coal Report 2012, Table 34, “Average Price of Coal Delivered to End Use Sector by Census Division and State, 2012 and 2011. Steam and metallurgical export average prices are for first three quarters of 2014, source: EIA Quarterly Coal Report, Table 10 “Average Price of U.S. Steam Coal Exports” and Table 12 “Average Price of U.S. Metallurgical Coal Exports”

How these deposits are divided and the size of reserves by ownership is important. The federal government is the largest holder of coal reserves, with almost a third of total coal reserves amounting to 87 billion short tons, and BLM is responsible for coal leasing on all of the 570 million acres of the federal coal mineral estate (Humphries and Sherlock 2013, 6).<sup>49</sup> In 2013 474,025 acres were under lease for coal mining, 42% of which were in Wyoming, 18% in Colorado, 18% in Utah, 9% in Montana, and 2% in Eastern States (BLM 2014 *Total Federal Coal Leases in Effect, Total Acres Under Lease, and Lease Sales by Fiscal Year Since 1990*). Most federal land holdings are in the Western states, where cheaper steam coal is more prevalent. Overall, in 2013 40% of U.S. coal production occurred on federally leased land – almost all in the states of Wyoming (80%), Montana (6%), Utah (3%), and Colorado (3%) (EIA 2014, *Sales of Fossil Fuels on Federal and Indian Lands*, Table 10). One particular basin, the Powder River Basin in Wyoming and Montana, dominates federal coal production. The Powder River Basin is the source of 87% of all federally leased coal, and has an estimated 25 billion tons of economic coal resources (Scott and Luppens 2013). Wyoming is by far the largest producer of coal in the U.S., and most of this production is from federal holdings and is subbituminous coal used for electricity generation (EIA 2013, *Annual Coal Report 2012*, Table 6). In 2012 only eight states had federal coal production, and in Western states federal coal production made up most of the state’s total coal production as seen in Table 7.

**Table 7:** Share of federal coal production on states with federal coal production, FY 2012

<b>State</b>	<b>Total Coal Production<sup>50</sup></b> (Short tons)	<b>Federal and Indian Land Production<sup>51</sup></b> (Short tons)	<b>Percent Federal Production</b>
Alabama	19,000,000	2,000,000	11%
Arizona	8,000,000	8,000,000	100%
Colorado	29,000,000	19,000,000	66%
Montana	37,000,000	27,000,000	73%
New Mexico	22,000,000	12,000,000	55%
North Dakota	27,529,000	4,000,000	15%
Utah	17,016,000	13,000,000	76%
Wyoming	401,442,000	374,000,000	93%

As noted above, leases are only subject to renewal after expiration of their initial 20-year period, and every 10 years thereafter. That means that any policy change would only affect leases as they come up for readjustment. Therefore it is important to know the age of current leases and the current and future coal production from proposed leases, leases within their initial 20-year period, and leases within a 10-year added term.

Unfortunately, there are no data available to answer this question. What we do have, from GAO,

<sup>49</sup> The BLM also has a role in the small amount of coal leasing and production on Indian lands – in 2013, production on Indian lands totaled 19 million short tons, or 1.9% of total coal production for that year (EIA 2014, *Sales of Fossil Fuels on Federal and Indian Lands*, Table 2).

<sup>50</sup> EIA Annual Coal Report 2012, December 2013, Table 1 “Coal Production and Number of Mines by State and Mine Type, 2012 and 2011.” Originally reported in thousand short tons, rounded for comparison within Table 7

<sup>51</sup> Source: EIA Sales of Fossil Fuels Produced on Federal and Indian Lands, June 2014, Table 10 “Sales of coal production from federal and Indian lands, FY 2003-13.” Originally reported in million short tons

Appendix II, is data on the estimated coal resources at the time of leasing for every year since 1990. This amount (from 1990 to 2010) is 9,010,500,000 tons. Production in 2010 was 478,000,000 tons, approximately 1/20<sup>th</sup> of existing leases. Thus, the amount of lease holdings that could be subject to a royalty adjustment per year appears to be quite small, although this important point needs further research. However, we do know that the amount of coal that has been proposed for leasing is significant. For instance, Wyoming's Buffalo Field Office in its 2013 Draft Resource Management Plan expects to award 28 leases (mostly extending the life of existing leases) with expected production of 10.2 billion tons of coal over the course of the next 20 years (BLM Buffalo Field Office 2013, p. 671).

Finally, trends in the US coal market have increased the importance of Western federal coal. Since 2000, there has been an increasing share of Western region production relative to the Appalachia and Interior regions, and there has been increasing concentration of producers within the Western region (EIA 2013, *Today in Energy*). In 2012, the top four coal producers produced 51.6% of total US production (EIA 2013, *Annual Coal Report 2012*, Table 10). Furthermore, the top 11 coal mines – mostly in the Powder River Basin – produced 39.4% of total US production in 2012 (*id.*, Table 9).

### 3.2 Economic Issues

In this section we examine from an economic point of view the case for using the federal coal leasing program with an SCC as a vehicle for internalizing the climate change externalities from coal throughout its transformation from extraction to utilization.

#### 3.2.1 Economic Analysis

The key concern is the need to internalize externalities of polluting activities if social welfare is to be maximized. Externalities are the damages that occur from economic activities that are not otherwise captured – i.e., internalized -- in market transactions. In this case, where coal externalities are not internalized, buyers and sellers of coal do not take into account the damages GHGs cause from the coal lifecycle. From an economy-wide perspective, the socially optimal level of a given polluting activity occurs when its price reflects its full social opportunity cost, which includes its marginal cost of production plus its marginal external damage. If there were a policy to tax coal at its marginal damage, then the price of coal would be much higher and, without an offsetting surge of technological progress, coal would be a much less attractive fuel to use.

However, internalizing externalities at the mine is only one of many possible places to do so. These places can be described as being upstream (mine), downstream (the power plant smokestack) or mid-stream of the activity chain. For many polluting activities and types of pollutants, internalizing on the extraction of an input rather than an output and, further, internalizing on output, rather than emissions from using or burning that product, is problematic. If the pollutant of concern was SO<sub>2</sub>, a charge on coal extraction at the mine would not provide incentives for reducing SO<sub>2</sub> at the smokestack or at a coal washing stage. Also, because different types of coal have markedly different sulfur content, a per ton charge would have to vary by coal type – adding complexity. Thus in this case regulating downstream is preferred.

For the case of CO<sub>2</sub> (or GHGs, for that matter) from coal, however, these arguments are far less compelling. The CO<sub>2</sub> emissions factor varies only slightly by coal type<sup>52</sup> and burning environment, and

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<sup>52</sup> According to EIA, the pounds of CO<sub>2</sub> emissions per kilowatt hour for different ranks of coal are as follows: bituminous, 2.08; subbituminous, 2.16; lignite, 2.18. The corresponding pounds of CO<sub>2</sub> per kilowatt hour for the Wyoming Southern PRB coal listed in Table 4 is 2.17. For more information, see:

there are not, at the moment, economical end-of-pipe approaches to removing CO<sub>2</sub> from the smokestack. Thus, there is little behavioral difference between internalization at the mine versus smokestack. In addition, most federal coal for power generation is Western coal with relatively lower carbon and sulfur content than higher grade coal in Eastern reserves.

There are several additional theoretical concerns. One is about the “rebound effect” that can occur with some downstream policies.<sup>53</sup> For instance, increasing fuel economy standards on vehicles makes it cheaper to drive, which works against the policy, which is designed to limit driving and its CO<sub>2</sub> emissions. An upstream policy doesn’t have this problem.

Another issue is administrative simplicity, or what economists call transactions costs. Transactions costs vary with the number and size of entities that need to be subject to monitoring and enforcement. The fact that there are a relatively small number of coal mines on federally leased land – around 300 active leases in 2013 – but around 1300 coal-fired electric generating units would suggest an upstream approach.<sup>54</sup> The previously noted concentration of coal production, particularly in the western region, suggests high coverage of such an approach. However, the fact that regulated utilities already report fully on their operations argues for regulating downstream.

Another issue is coverage, i.e., where should a tax be placed to provide as broad an internalization as possible. The standard answer is upstream because, as for coal, regulating at the mine has the advantage of applying, in theory, to all uses of coal not just for coal used in particular sectors that happen to be regulated for carbon emissions, such as the power sector in the CPP. The CPP, for example, will provide no direct incentive to reduce exports or the use of coal in industrial processes.

A limitation of a charge only on federal coal is that privately-held coal resources (including almost all metallurgical coal) would be by definition excluded from the policy. This could result in unintended or perverse consequences arising from the resulting more favorable market position of private or state-owned coal, some of which are noted below.

Thus, there is a key tradeoff here. There are good reasons to internalize climate externalities from coal at the mine, but its limitation to federal coal provides insufficient coverage to make the policy work as intended. Of course, Congress could create a program to also put an SCC on private and state coal. But this is outside of our scope here and seems highly unlikely.

### 3.2.2 Economics of Taxes on Coal Leasing in General

Let’s first consider the basic economics of adding a charge to new or renewed coal leases, without considering which of the three alternatives (bid price, rent and royalty) is chosen.

With an SCC of \$46/ton of CO<sub>2</sub> and an average of 2.05 metric tons of CO<sub>2</sub> produced for every metric ton of coal burned,<sup>55</sup> the SCC per ton coal would be \$94, compared to steam coal prices at the mine of

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<http://www.eia.gov/tools/faqs/faq.cfm?id=74&t=11>

<sup>53</sup> For an interesting discussion of a rebound effect in fossil fuel consumption using a Coasian analysis, see (Harstad 2012)

<sup>54</sup> See BLM 2014, Public Land Statistics 2013 Vol. 198, Table 3-18 for federal coal leases. See EIA, February 14, 2014, “Energy in Brief: AEO2014 projects more coal-fired power plant retirements by 2016 than have been scheduled” for coal-fired electric generating units.

<sup>55</sup> 2.05 tons is the average CO<sub>2</sub> emissions factor per metric ton of coal burned as used by EPA. As noted previously, this varies slightly but not drastically for different ranks of coal. See ‘Pounds of coal burned’ at <http://www.epa.gov/cleanenergy/energy-resources/refs.html>



\$12/ton for PRB and \$38/ton for Uinta, and an average price paid for coal by electric utilities of \$46 domestically and \$70 for exported steam coal. A tax of \$94 (irrespective of where in the process it is levied) would probably drive new federal coal value to zero, ending all demand for new federal coal and increasing demand for other coal (including imports!) to compensate. In the limit, if the supply curve of US coal were essentially flat, prices would remain unchanged, as would CO<sub>2</sub> emissions, although the government would lose its lease-related revenues. In the more likely event that the supply curve for coal were upward sloping, the overall price of coal would increase, putting coal at a disadvantage against other fuels and possibly leading to lower CO<sub>2</sub> emissions as a result. As any policy raising coal prices would do, further incentives would be created to shift to other fuels, economize on electricity use, and reduce use of electricity-rich products. The lower the carbon charge, the smaller the shift to private or state coal and the less the rise in price.

A large enough tax would basically zero out the federal coal program (at least over time, as it applies to coal leases up for renewal), with the related greater effect on U.S. coal prices and federal revenues. To the extent that existing leases were exempt from the tax, they would presumably be developed more intensively than would be economical without the tax.

The specifics of how a carbon charge on only federal coal would raise the price of coal in the market is difficult to ascertain.<sup>56</sup> One would need to know the elasticity of substitution between federal coal and other coal (including imports), for which further research would be needed. Following SO<sub>2</sub> regulations under the 1990 Clean Air Act, low-sulfur western coal became increasingly preferred by U.S. electric utilities over high-sulfur coal, although some studies suggest that part of the increase in price of delivered low-sulfur coal was due to the market power of railroads (Busse and Keohane, 2012; Gerking and Hamilton, 2007; Burtraw, 2000). A 2012 EIA analysis of the elasticity of substitution between coal, natural gas, and petroleum for electricity generation found that a 10% increase in the price of coal relative to natural gas would lead to a 1.4% increase in the use of natural gas relative to coal (EIA 2012). Depending on the elasticity of substitution between federal coal and other coal, and between non-federal coal and other fuel sources, an increase in the price of federal coal could therefore lead to greater use of natural gas rather than coal. Indeed, EIA suggests as much in its latest Annual Energy Outlook, stating that “In general, assumptions that reduce the competitiveness of coal versus natural gas lead to lower coal production” (EIA 2014, *Annual Energy Outlook 2014*, MT-32).

### 3.2.3 Distinguishing Among the Three Options

In principle, capitalization of a carbon charge throughout the supply and demand chain for coal would occur regardless of where in the lifecycle the charge is imposed. And that regardless of where in the lifecycle the intervention takes place for federal coal, there will be repercussions in the rest of the coal market. Similarly, the effect on the size of CO<sub>2</sub> emissions reduced would in principle be the same regardless of where the intervention takes place in the lifecycle. This is in principle.

In reality, of our three upstream options, adding a premium to the royalty payment makes the most economic and administrative sense. It would internalize the climate externality with less ambiguity about coal production than an adjustment to the bonus bid or rental payment. For each ton of carbon mined, the operator would pay a charge for that ton’s calculated emission potential in addition to BLM’s conventional royalty fee. This charge would make it less profitable to mine the coal and ultimately

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<sup>56</sup> However, EIA has modeled projections for the total U.S. coal sector with an SCC in place in the 2014 Annual Energy Outlook. When compared to the Reference case, an SCC of \$34/ton in 2040 leads to 32% lower coal production, and an SCC of \$85/ton in 2040 leads to 73% lower coal production (EIA 2014, *Annual Energy Outlook 2014*, MT-32).

lower the amount of federal coal mined. The operator, knowing the royalty payment would be larger with the carbon charge, would also make a lower initial lease bid. Counting the royalty payment, revenues could increase or decrease.

In contrast, a charge on the bonus bid (or lease rental) would apply to coal not yet mined – possibly the amount of the recoverable coal in the lease that the operator is required to state. However, this stated amount need not be equal to the amount of coal that would eventually be mined and therefore not equal to the damage the coal would do, once mined and burned. Once paid as part of the bonus or rental bid, there would be no incentive to limit mining the coal. In fact, with the charge on the bonus bid, the incentives to limit coal mining would appear earlier in the process, but would be less directly calibrated to damage from actual production than with the charge on the royalty.

#### 3.2.4 Policy Interactions

A policy to internalize GHG externalities at the mine would not exist in a vacuum. The coal industry itself is subject to a host of regulations to internalize other externalities that might contribute to lower CO<sub>2</sub> or methane emissions as ancillary benefits.<sup>57</sup> These do not present any particular difficulties for a carbon charge policy, as GHG emissions subject to such a policy would be lower. Industries that use coal, namely the electric power industry, but also the chemical industry and others, also are subject to regulations that might make coal less likely to be used or lead to economizing on coal use, which would lead to lower GHG emissions. Again, these types of regulations present no particular difficulties.

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<sup>57</sup> For example, the mercury rule for electric utilities. See: EPA, Mercury and Air Toxics Standards for New Power Plants. 78 FR 24073 (24 April 2013) (amending 40 CFR 60 and 63)

### BOX 3: The SCC and BLM Planning

There are a number of points in the BLM planning process prior to lease sales where the agency could consider the SCC in making decisions about what lands to lease for coal. BLM's planning must comply with NEPA, for which the White House Council on Environmental Quality (CEQ) has just released new guidance<sup>57</sup> on accounting for greenhouse gas emissions and climate change impacts. Among a number of revisions, this new guidance extends its previous 2010 draft guidance to cover federal land and resource management decisions.

"A tiered, analytical decision-making approach using a programmatic NEPA review...can be particularly relevant to addressing proposed land, oceanic and resource management plans... Examples of project- or site-specific actions that can benefit from a programmatic NEPA review include...authorizing leases for oil and gas drilling...and approving hard rock mineral extraction."

"When assessing direct and indirect climate change effects, agencies should take account of the proposed action – including "connected" actions... In addition, emissions from activities that have a reasonably close causal relationship to the Federal action, such as those that may occur as a predicate for the agency action (often referred to as upstream emissions) and as a consequence of the agency action (often referred to as downstream emissions) should be accounted for in the NEPA analysis."

BLM's coal management program has been tiered for NEPA compliance since its original programmatic review in 1979. That [Final Environmental Statement: Federal Coal Management Program](#), amended by an [FEIS Supplement](#) released in 1985, remains in force today. It informs all BLM coal decisions, including [Resource Management Plans](#) that designate multiple use lands suitable for coal development and lease sale plans that support decisions to offer specific tracts for coal mining.

BLM had already begun to consider carbon externalities in some of its pre-lease planning activities. For example, in its environmental assessments of oil and gas lease sales, it applies the SCC from the Interagency Working Group to an estimate of greenhouse gas emissions "associated with potential development on lease sale parcels." It does not look beyond the lease boundaries to take into account ensuing emissions from transportation, refining or burning of oil and gas downstream. The new CEQ guidance instructs BLM to look downstream and reasserts its longstanding directive that "As called for under NEPA, the CEQ Regulations, and CEQ guidance, the NEPA review process should be integrated with planning at the earliest possible time."

Accordingly, BLM may choose to undertake a new programmatic NEPA statement to support the coal program going forward. This would be the earliest possible time to consider the SCC in shaping overall federal coal activity. Applying the SCC to federal coal could also be done systematically when BLM prepares Resource Management Plans, its basic multiple-use planning activity under the Federal Land Policy and Management Act (FLPMA). This multiple-use planning is a particularly promising place to incorporate full-cost accounting for coal—that is, the full costs and benefits of coal across its complete life cycle. It is early in the coal decision sequence, it includes all BLM lands for coverage and consistency, it creates planning areas of similar resources and recognizes differences among them, it has extensive public engagement, and it is where BLM explicitly applies its mandate to consider multiple use and environmental trade-offs. Such incorporation gives BLM the opportunity to decide if a given coal lease or coal resource region should, in light of all these tradeoffs, should be put up for lease.

The possible problems arise when a coal-using sector is confronted with policies whose purpose is to reduce CO<sub>2</sub> or other greenhouse gas emissions. In the limit, a policy, such as carbon cap and trade, could apply to an entire sector or many sectors. In this case, as noted above in the export discussion about the EU ETS, a carbon charge at the mine would be largely redundant as CO<sub>2</sub> emissions from burning coal would be capped, so an additional ton burned would have to be offset by reductions in CO<sub>2</sub> elsewhere. A middle case is the Clean Power Plan (CPP). Since the plan targets CO<sub>2</sub> emissions from the electric power sector, it would to some degree internalize the externalities from coal (and other fossil fuels). This internalization would be particularly obvious if the states adopted a cap and trade program to implement the CPP. Even if they did not, we can see some degree of internalization through regulation as power plants would become more efficient, lower carbon fuels would be switched in to replace coal, and other impacts would occur to lower CO<sub>2</sub> emissions, with a goal of 30% reductions from 2005 levels by 2030 (EPA 2014, *Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units; Notice of proposed rulemaking*). Whether a carbon charge at the mine would be partly, fully or not at all redundant in this case would require further study, although administrative simplicity would argue for locating the policy intervention either upstream or downstream rather than in both places.

### 3.2.5 Fugitive Methane and Exported Coal

Even if the CPP and a royalty premium on coal at the mine are regulating the same coal emissions twice, there are at least two categories of emissions that would remain uninternalized by the CPP – (i) all of the GHG emissions related to the coal lifecycle other than those related to power plant coal burning, particularly fugitive methane emissions at the mine and (ii) emissions from exported coal (as well as non-utility uses of coal).

While the methane and CO<sub>2</sub> emissions from these early stages in the coal lifecycle are small relative to the CO<sub>2</sub> emitted from burning the coal (see Table 3), they are not inconsequential. In *Highcountry Conservation Advocates v. US Forest Service*, these fugitive methane emissions at the minemouth as well as emissions from coal combustion downstream were pointed to by a District Court judge as worthy of monetization via the SCC in agency cost-benefit analysis (*Highcountry Conservation Advocates v. US Forest Service*, Order of June 27, 2014, p. 17). In the project EIS, these fugitive methane emissions were estimated at 1.23 million annual tons of carbon dioxide equivalent emissions, which, depending on the SCC used, could range from \$6 million to \$984 million per year (*High Country Conservation Advocates v. US Forest Service*, Order of June 27, 2014, p. 19). Alternatively, using the estimates of the social cost of methane cited in table 2 of box 2, the social cost could range from \$35.82 million to \$97.62 million. Methane emissions of this amount would qualify as worthy of quantitative disclosure under the new draft guidance on consideration of climate change impacts in NEPA documents, which establishes a disclosure threshold of 25,000 tons of carbon dioxide emissions (CEQ 2014, p. 18). Note, however, that most methane emissions from coal mining are from underground, not surface mines, whereas most federal coal is surface mined.

The leakage from coal exports is potentially much larger. The CPP effectively puts a price on carbon from burning coal in power plants, but misses coal used by other domestic sectors, whether for power, heat or product manufacturing, as well as for export. Thus, the CPP, by lowering the demand utilities have for coal, and therefore lowering its domestic price, creates incentives for other countries to import our

coal. To the extent that other countries lack regulations to internalize the CO<sub>2</sub>-related damages from using coal, this creates a socially undesirable “leakage” from that policy. In this context, what would be the effect of an SCC applied to federal coal at the mine?

While we know that approximately 10% of total US coal is exported, we do not know how much federal coal is exported (GAO 2013, p. 37-38). We can, however, see how much coal individual states export. For the four states which produce 92% of all federal coal, Ernst & Young report the following (Table 8):

**Table 8:** Coal Exports by State, 2011. Reproduced from Individual State Profiles in Appendix B to Ernst & Young Report “U.S. Coal Exports: National and State Economic Contributions”

State	Coal Exports (million short tons)	Share of total production that is exported	Share of exports that are steam coal
Wyoming	4.5	1%	76%
Montana	13.2	34%	72%
Utah	1.1	6%	100%
Colorado	3.0	12%	39%

The table illustrates that, with the exception of Montana, the states that make up virtually all federal coal production export a very small share of this production. While Montana has experienced a sharp increase in coal exports, going from approximately 2 million short tons of exported coal in 2009 to approximately 13 million short tons in 2011, the other states have not experienced similar levels of growth (Ernst and Young 2013, p. 47). Wyoming, for instance, which is responsible for 80% of all federal coal production, exports only one percent of its total coal production.

Nevertheless, there are signals that the potential leakage could grow in the future. While exports have traditionally been dominated by metallurgical coal, a 2013 Congressional Research Service report on US coal production predicts both that steam coal exports will become of increasing importance and that “if trends continue, the U.S. coal industry will likely become more concentrated and produce more on federal lands” (Humphries and Sherlock 2013, 20).<sup>58</sup> Finally, the EIA projects total world steam coal import demand to rise from 757.7 million metric tons in 2012 to 844.4 million metric tons in 2020, and to 1,054.5 million metric tons in 2040, driven by an increase in import demand of 35% from Asia (EIA 2014, *Assumptions to the Annual Energy Outlook 2014*, Table 12.3).

A carbon charge on federal coal would reduce this source of carbon leakage by raising the price of coal. That is, even if state or private coal could take up the slack, the diversion of demand to these sources of coal would drive up prices to foreign buyers. Second, there is a legitimate question about whether the externalities from coal exports are already being internalized, at least in some countries. Below in Table 9 is a list of leading importers of U.S. coal and the quantities imported for the first half of 2013, with total imports and percent change for the first half of 2014. Most prominently, given that Europe is the largest importer of U.S. coal, the EU’s Emissions Trading System (ETS) caps carbon emissions from the countries in the EU. Thus, the carbon emissions from coal imports from the U.S. must be offset by reductions in CO<sub>2</sub> emissions elsewhere in the EU economy (in theory). In this case, there would be no additional emissions from coal imports to the EU and the climate damages are therefore zero (unless the cap is not binding) and, implicitly, internalized.

<sup>58</sup> A 2014 report prepared by Sightline Institute, titled *Unfair Market Value: By Ignoring Exports, BLM Underprices Federal Coal*, presents evidence that federal coal is indeed going abroad.

Several other countries or smaller jurisdictions have carbon policies in place that are at least partially internalizing climate damages from using coal. Of the top ten destination countries for U.S. coal, six can be said to have a price on carbon currently: these include European countries in the EU ETS (Netherlands, UK, Italy, Germany), Mexico, and Japan (Kossoy et al. 2014). Emerging carbon price schemes are developing in South Korea, which intends to launch its cap and trade system in 2015, and China, which has announced a cap on total amount of coal consumed and has seven cap and trade pilot markets (Kossoy et al. 2014; Munnings et al. 2014).

**Table 9:** Top Ten Destination Countries in the first half of 2013 and percent change for the first half of 2014, in short tons.<sup>59</sup>

Country	2013	2014	Percent Change
The Netherlands	7,550,216	6,784,346	-10.1
China	6,480,622	1,366,019	-78.9
United Kingdom	6,472,170	5,410,376	-16.4
Brazil	4,588,197	3,966,369	-13.6
South Korea	4,183,307	4,638,976	10.9
Italy	3,551,107	3,519,646	-0.9
Japan	2,975,684	2,341,755	-21.3
Canada	2,716,705	2,823,065	3.9
Germany	2,612,490	2,468,239	-5.5
Turkey	2,582,010	2,326,730	-9.9

Overall, therefore, a carbon charge on federal coal, with or without domestic downstream policies in place, would serve to only partially close CO<sub>2</sub> leakages through exports to importing countries. Leakages could still occur as other supplying countries take the place of U.S. coal supply. Presumably, importing countries were buying U.S. coal because it was cheaper than some other sources. Without this coal, the world price of coal would rise, acting as a partial mechanism for internalizing climate damages.

### 3.3 Factors Increasing the Competitiveness of Federal Coal

If the carbon charge on federal coal is high enough, production and leasing activity could actually end. How high this charge would have to be for this outcome requires further study, but clearly as the carbon charge rises the competitiveness of federal coal would fall. What conditions could work to increase competitiveness of federal coal in the face of any given charge?

One way would be for the demand for coal to rise, raising its price enough to make mining federal coal profitable. EIA's forecast for the Northern Great Plains (Powder River), which takes into account both changes in coal demand and supply, shows coal prices rising a modest 2.5% from 2012 to 2040, and a more limited 1.1% for Other West and Non-contiguous areas (which includes the Uinta Basin).<sup>60</sup> Rising demand for U.S. coal from other countries could be a part of a rising price story. But, reduced prices for

<sup>59</sup> Source: EIA 2014, Quarterly Coal Report April-June 2014, Table 7

<sup>60</sup> EIA 2014, Annual Energy Outlook 2014, "Coal Production and Minemouth Prices by Region, Reference Case." Available at: <http://www.eia.gov/oiaf/aeo/tablebrowser/#release=AEO2014&subject=3-AEO2014&table=94-AEO2014&region=0-0&cases=ref2014-d102413a>

natural gas are already disadvantaging coal and new climate agreements and any new plans coming out of the Paris climate meetings will put downward pressure on demand.

More significant is the possibility of new technology being developed to cost-effectively reduce CO<sub>2</sub> emissions. The big question here is the future path of carbon capture and sequestration (CCS) for coal-burning utilities: how effective will this new technology be in removing CO<sub>2</sub> from the waste stream, and how quickly will coal-fired facilities install it. Under EPA's CPP proposal, no new coal plants are likely to be built without CCS. Retrofitting existing plants is occurring on a pilot basis. For example, the Boundary Dam Carbon Capture Project in Saskatchewan will extract up to 90% of CO<sub>2</sub> for underground enhanced oil recovery injection.<sup>61</sup> Widespread adoption of CCS is far from certain. Moreover, renewable power technologies and natural gas extraction technologies are not standing still either, increasing their competitiveness against coal.

Finally, the carbon charge actually adopted could be so low as to be inconsequential for competitiveness (and CO<sub>2</sub> reductions), but which would at least establish a precedent. Other than for precedential value, a low carbon charge could be justified on the grounds that the domestic damages from global warming are the only relevant externalities. The IWG estimates domestic damages at 7-23% of global damages, using a 3% discount rate and alternative approaches to determining a US share within the global total. At the lower end of this range, the domestic SCC per ton of coal would be \$6.60 (0.07\*\$46\*2.05), a large fraction of the PRB coal price (\$12/ton) but a smaller fraction of the Uinta coal price (\$42/ton).

Moreover, there are acknowledgments from many experts that the estimates of the SCC are likely to increase over time as models used in such exercises are refined and extended to include impacts recognized in the climate change literature but not yet known precisely enough to enter the models. Further, the SCC, as estimated by the IWG (and reported in Table 1) already rises over time. These trends don't preclude use of a very low carbon charge. But arguments for a higher one will likely become even more compelling over time.

#### 4. Conclusion

This report explores the legal and economic questions raised by implementing a policy on federal coal lands that seeks to consider greenhouse gas emissions (GHGs) over the entire coal lifecycle. It focuses on internalizing the climate-related damages from CO<sub>2</sub> (and to a lesser extent other greenhouse gases) at the coal leasing (or upstream) stage through BLM planning and analyses or through changes to the terms and conditions established for tracts of land being offered for sale.

Our legal analysis supports the view that the arguments in favor of BLM authority under current law to incorporate a carbon charge reflecting the external costs of coal over its lifecycle in coal lease terms and conditions are stronger than the arguments that such authority is lacking.

- BLM is required by statute to consider the environment in making multiple use decisions for the public lands it administers, and its coal leasing statutes give it broad discretion to set financial terms of leases – rents, royalties, and to a lesser extent, bonus bid minimums.
- Nevertheless, the legal arguments against BLM environmental charges (e.g., a carbon charge)

<sup>61</sup> For more information, see the project website at <http://www.saskpowerccs.com/ccs-projects/boundary-dam-carbon-capture-project/>.

are strongest if such charges result in a complete or at least very large abrupt reduction in coal extraction from federal lands.

- Probably the simplest, most rational and least legally problematic point of action would be for BLM to add a carbon charge on top of the existing royalty. The royalty for surface mined coal has a floor of 12.5% of production value but no ceiling.
- It would be most problematic legally to incorporate the SCC on the bonus bid.
- BLM can establish procedures for incorporating CO<sub>2</sub> charges in lease terms through standard notice-and-comment rulemaking.

Of course, the courts will have the final say on what BLM is allowed to do. Internalizing CO<sub>2</sub> costs in coal leasing is not anticipated by the relevant leasing statutes, which are more oriented toward making coal available, getting value for the resource and maximizing recovery. It may turn out that BLM's best opportunity to recognize the external costs of CO<sub>2</sub> in coal leasing will occur prior to the leasing stage, when the agency makes decisions on which lands will be open for coal development. This opportunity has recently been bolstered by the issuance of draft guidance on including climate change impacts in documents produced to satisfy requirements under the National Environmental Policy Act (NEPA). We note the potential role of BLM's planning activity in Box 3, but it is not the main subject of this report.

Although the legal case for such a BLM initiative is relatively strong, the economic case is weaker in contrast. The point of incorporating an SCC is to raise the price of coal to internalize its climate change externalities. But there are at least four arguments against this action. The first is that coal production on BLM lands is only 40% of total coal production. Therefore any increase in prices of federal coal driven by increased royalties will be diluted by the lack of any equivalent price hike on coal mined on state or private lands. Second, federal coal lease auctions are not competitive—over 90% have only one bidder. Thus, at least for new leases, if BLM raises royalty rates firms will lower their lease bids in reaction to the lower profitability of that coal, eliminating some or possibly all upward pressure on coal prices. At the same time, to the extent the additional fee is large or the BLM's Fair Market Value calculation doesn't adjust downwards accordingly, bidders may move off of federal land, thereby bidding up the price of state and private coal, raising national coal prices (a good result if the goal is to increase coal costs so as to better reflect coal externalities). The third argument is that BLM does not appear to have the authority and, if it has the authority rarely uses it, to change lease terms within a contract period (20 years to start and 10 years thereafter). Therefore, existing leases would not come under a carbon internalization policy until they were renewed, dramatically limiting the short-term impact of the policy on coal prices. The fourth argument is that if the Clean Power Plan (CPP) is implemented, it may well at least partly internalize the SCC, possibly making internalization at the mine at least partly redundant.

The current administration has signaled some willingness to make changes to the coal leasing program. In response to the GAO report, the BLM has released a new *Coal Valuation Handbook*, which, among other things, requires more consideration of export prices in Fair Market Value calculations. More significantly, in December 2014 the Council on Environmental Quality released an updated draft guidance on consideration of climate change impacts in NEPA. While the draft guidance is still preliminary – indeed, the original draft guidance on the subject which was released in 2010 was never finalized – it addresses the potential for incorporating climate change impacts in the land management and planning stage rather than during leasing.

Our report describes but takes no position on the appropriate size of the SCC. However, we note four issues with applying the SCC as developed by the IWG to BLM coal leasing decisions. These issues



transcend the BLM context and include: : uncertainty in the estimates; the question of whether a global or domestic damage estimate should be used; the exclusion of damages from non-CO<sub>2</sub> gases in the SCC; and the original development of the SCC for use in supporting documents (i.e. Regulatory Impact Analyses), rather than in operational decisions (e.g., sale of a particular lease tract).

We find that the global SCC per ton of coal is currently about \$94 (given the Administration's estimate of around \$46/ton CO<sub>2</sub> (see Table 1)) and the slightly greater than two tons of CO<sub>2</sub> created for every ton of average coal burned, whereas the price of the most prevalent type of federal coal used by power plants is Powder River Basin coal currently sold at \$12. A full internalization of this level of social cost on all coal mined (*including private and state coal*) would be hugely disruptive for the coal sector, the electricity sector and the U.S. economy as a whole. On the other hand, with this internalization only on federal coal, private and state lands and even imports could possibly take up much of the price pressure. Indeed, cheap natural gas could alleviate such pressure as well. Still, compared to the current situation with the controversy and looming legal battles over the EPA's Clean Power Plan, incorporating the SCC at the upstream level may be the best way to internalize externalities, in part because emissions from burning exported coal could be addressed for destination countries not themselves internalizing CO<sub>2</sub> emissions. However, the upstream policy would require consideration of interactions with downstream policies (including those on other pollutants) through the use of rebates, tax offsets, etc.

With emerging policy decisions raising understandable concerns about the scale of disruptive economic consequences, one can argue for an extended transition of adjustment to full internalization of climate externalities, through one that starts with a significant first step – such as implementing a small royalty premium, recognizing that a small charge would be unlikely to significantly affect the coal market price. This charge would not discriminate between federal coal for domestic use or exports, although companies selling into the EU and other places where carbon caps or taxes are in place could get a rebate. Such a rebate could also be an appropriate offset to whatever restriction (in terms of its carbon tax equivalent) is imposed under EPA's Clean Power Plan. It would be still more ambitious and effective for upstream charges to be levied on both existing and new or renewed coal leases. Ultimately, and for maximum efficiency, such charges should be applied to all fossil fuels extracted from federal, state and private lands. But, before major policy action is taken, more study is needed on how domestic and world coal markets might react to increased royalties on U.S. federal (as well as state and private) coal lands.

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**To:** Marten, Alex[Marten.Alex@epa.gov]  
**From:** Roberts, Martha  
**Sent:** Tue 6/30/2015 2:16:37 AM  
**Subject:** Re: Thanks

Happy to help!! Hope you get it out the door soon.

Sent from my iPhone

On Jun 29, 2015, at 9:35 PM, Marten, Alex <[Marten.Alex@epa.gov](mailto:Marten.Alex@epa.gov)> wrote:

Thank you for your help with the SCC RTC earlier. I know how busy you are so it really means a lot that you were willing take the time.

--

Alex L. Marten  
phone: (202) 566-2301  
email: [marten.alex@epa.gov](mailto:marten.alex@epa.gov)



**To:** Marten, Alex[Marten.Alex@epa.gov]  
**From:** Alex Marten  
**Sent:** Fri 1/23/2015 11:09:16 AM  
**Subject:** Favorites  
[RiskReturnEnvironPolicyJAERE2014.pdf](#)  
[ATT00001.txt](#)

<http://web.mit.edu/rpindyck/www/Papers/RiskReturnEnvironPolicyJAERE2014.pdf>

**To:** Marten, Alex[Marten.Alex@epa.gov]  
**From:** Alex Marten  
**Sent:** Fri 1/23/2015 11:10:12 AM  
**Subject:** Favorites  
[WagnerZeckhauserUncertainty.pdf](#)  
[ATT00001.txt](#)

<http://hhei.umn.edu/assets/papers/WagnerZeckhauserUncertainty.pdf>

**To:** Marten, Alex[Marten.Alex@epa.gov]  
**From:** Dominic Watson  
**Sent:** Tue 3/17/2015 7:45:48 PM  
**Subject:** Questions for a Thesis  
[EPA Interview Questions \(1\).pdf](#)  
[EPA Interview Questions \(1\).docx](#)

Dear Dr. Marten,

My name is Dominic, I am a student at UPenn writing a thesis on information flow as it affects U.S. Climate Change Policy. I had a chance to speak with Al McGartland earlier today who suggested that I could send you a few research questions in written form.

For your reference I have attached the questions in both word and pdf format. If you have a moment I would greatly appreciate getting your responses. Please let me know if you have any comments or questions concerning the thesis topic.

Thank you very much for taking the time.

Best,  
Dominic

--

Dominic Watson  
Bachelor of Arts Candidate 2015  
College of Arts and Sciences, University of Pennsylvania  
[+1-617-417-7675](tel:+16174177675) | [dowatson@sas.upenn.edu](mailto:dowatson@sas.upenn.edu)

**To:** Marten, Alex[Marten.Alex@epa.gov]  
**From:** Shouse, Kate  
**Sent:** Thur 4/2/2015 1:31:58 PM  
**Subject:** RE: New Adventure

Thanks!

**From:** Marten, Alex  
**Sent:** Thursday, April 02, 2015 9:28 AM  
**To:** Shouse, Kate  
**Subject:** FW: New Adventure

--

Alex L. Marten  
phone: (202) 566-2301  
email: marten.alex@epa.gov

Begin forwarded message:

**From:** "Johnson, Laurie" <[ljohnson@nrdc.org](mailto:ljohnson@nrdc.org)>  
**Date:** March 26, 2015 at 5:58:10 PM EDT  
**To:** "Johnson, Laurie" <[ljohnson@nrdc.org](mailto:ljohnson@nrdc.org)>  
**Subject:** New Adventure

Dear Colleagues,

I'm writing to let you know I'll be leaving NRDC so that I can focus 100% of my time on an independent research project I'm launching in partnership with the University of Massachusetts, several New Jersey High Schools, and my collaborator, Sieren Ernst. Sieren is Principal and Founder of Ethics & Environment, a DC based consulting firm focusing on climate change policy. I will also continue contributing to the Cost of Carbon Pollution project and other research at New York University Law School's Institute for Policy Integrity, as an Affiliated Scholar.

My new contact information is further below.

For those of you interested in knowing a little more about the project: it is a “citizen science” effort combining an inter-high school climate cost data collection assignment with a video competition. It aims to engage students in assessing climate damages in their own communities—and collect data on those damages. If successfully demonstrated (we are starting with a pilot), we’re hoping to expand data collection into an open access data base platform to citizens at large who can submit their own cost data. (Not familiar with broad-based citizen science data collection? Here’s a [neat example](#) assessing bird populations and patterns housed at Cornell).

The idea developed out of my years at NRDC advocating for a more comprehensive “social cost of carbon” (SCC), the benefit-per-ton-of-CO2 metric used by the government to estimate carbon pollution reduction benefits—and the difficulty in communicating what a “price” on carbon means to normal people. I’ve also been frequently frustrated when getting inquiries on climate change costs (from reporters, all of you! ☐, etc.)...I hope to change that and, by documenting, quantifying, and assessing impacts, and empowering communities to give and receive that information. Of course, the collected impact data won't differentiate between what is due to climate change versus not. Rather it is intended to start assessing known and unknown costs—to highlight adaptation and mitigation needs, and help citizens advocate their unique needs.

It’s going to be an invigorating challenge. Wish me luck!

My new email signature contains all my relevant contact and affiliation information, and a more generalized description of the project.

Laurie T. Johnson, Ph.D.

Affiliated Scholar, *New York University School of Law, Institute for Policy Integrity*

Senior Economic Advisor, *Ethics & Environment*, and Director of the Citizen Climate Cost Project\*\*\*

Email addresses: [laurie.johnson@nyu.edu](mailto:laurie.johnson@nyu.edu) and [ljohnson@ethicsenvironment.com](mailto:ljohnson@ethicsenvironment.com)

(p) 202-779-3109

\*\*\*The Citizen Climate Cost Project (CCCP) is a unique collaboration from Ethics & Environment between high school students, academics, citizens and civic society institutions. Our mission encompasses several goals, including assessing and measuring impacts of climate change on American communities; actively engaging students and citizens in quantifying its costs; providing citizens with information to advocate for their

specific needs; and providing researchers and policy makers with data needed to develop sound adaptation and mitigation strategies.

The project is a first-of-its-kind citizen science effort consisting of several development stages that will reach an expanding audience. For more information about ----CCCP, please contact me at [ljohnson@ethicsenvironment.com](mailto:ljohnson@ethicsenvironment.com), or Sieren Ernst, Principal, Ethics & Environment at [sernst@ethicsenvironment.com](mailto:sernst@ethicsenvironment.com).

Laurie T. Johnson, Ph.D.

Chief Economist, Climate and Clean Air Program

Natural Resources Defense Council

1152 15<sup>th</sup> St NW Ste 300

Washington D.C., 20009

(o) 202-513-6274

**(m) 202-779-3109 PLEASE NOTE new cell number**

Blog: <http://switchboard.nrdc.org/blogs/ljohnson/>

**To:** Marten, Alex[Marten.Alex@epa.gov]  
**From:** Shouse, Kate  
**Sent:** Mon 3/30/2015 8:02:58 PM  
**Subject:** SCC brownbag: OAP reserved room for webinar  
SCC webinar

In case your plans change tomorrow, you (or anyone else interested) are welcome to join us.  
Room details attached.

**To:** Marten, Alex[Marten.Alex@epa.gov]; Shouse, Kate[Shouse.Kate@epa.gov]  
**Cc:** McGartland, Al[McGartland.Al@epa.gov]  
**From:** Fawcett, Allen  
**Sent:** Tue 2/3/2015 2:44:47 PM  
**Subject:** RE: SCC Check In This Morning

Thanks Alex, we'll be there.

Allen

**From:** Marten, Alex  
**Sent:** Tuesday, February 03, 2015 9:33 AM  
**To:** Fawcett, Allen; Shouse, Kate  
**Cc:** McGartland, Al  
**Subject:** SCC Check In This Morning

Allen and Kate,

Sorry for the short notice, but we are having a brief (30 min) SCC check in w/ Joel this morning at 10:30 in 3513 WJCN. If you would like to attend, or if Paul wanted to join, you would be welcome. I think the agenda will be focused on a status update of the different pieces.

Feel free to give me a call if you want more info.

--

Alex L. Marten  
phone: (202) 566-2301  
email: marten.alex@epa.gov



**To:** Marten, Alex[Marten.Alex@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; McGartland, Al[McGartland.Al@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]  
**From:** Wheeler, William  
**Sent:** Tue 1/13/2015 2:52:19 PM  
**Subject:** FW: FYI only, E&E News: "Researchers say the social cost of carbon will be 6 times the Obama administration's estimate"

FYI

---

Will Wheeler, Economist  
U.S. EPA, NCEE  
202-566-2264

---

**From:** Skane, Elizabeth  
**Sent:** Tuesday, January 13, 2015 9:38 AM  
**To:** Wheeler, William  
**Subject:** FYI only, E&E News: "Researchers say the social cost of carbon will be 6 times the Obama administration's estimate"

<http://www.eenews.net/climatewire/2015/01/13/stories/1060011557>

## **Researchers say the social cost of carbon will be 6 times the Obama administration's estimate**

Evan Lehmann, E&E reporter

Published: Tuesday, January 13, 2015

Climate change could have much larger impacts on the economy than the U.S. government is anticipating, according to an analysis released yesterday that suggests the social cost of carbon should be six times higher.

A paper by two Stanford University researchers argues that the true cost of releasing greenhouse gases is about \$220 a ton because rising temperatures could badly hinder a nation's economic growth over decades or centuries. The Obama administration estimates that the social cost of carbon is \$37 a ton.

The paper, published yesterday in the journal *Nature Climate Change*, adds to a growing number of voices calling for improvements to the complicated process of establishing the cost estimate, which is used to measure the benefits of regulations. A dozen federal agencies set the price using three computer models that project emission rates, economic activity and climate damages.

The Stanford paper bases its findings on prior research showing that the economic health of a country suffers during periods of high temperatures. Heat can harm agricultural and industrial output, while increasing political instability. In that way, the Stanford analysis subscribes to emerging calls among experts to incorporate new observations into the trio of models that date back to the 1990s.

"The social cost of carbon is almost certainly larger of what's being used so far," said co-author Frances Moore, a doctoral candidate at Stanford's School of Earth Sciences.

In a key departure from the government's analysis, the **paper** uses the previous empirical research to assert that climate impacts could damage a nation's economic growth rate over time, rather than just harassing its year-to-year economic output.

That could mean that nations face permanent malfunctions, like economic declines in labor, capital and technology from severe weather and other "temperature shocks." The authors say these bigger impacts have a "compounding effect" that is more damaging to the economy than temporary strains from heat on agricultural output and more expensive air conditioning costs.

"So the economy is kind of permanently lower," Moore said. "If you have repeated shocks, in that case, they accumulate over time. That's why even very, very small reductions in growth rates have these really big effects over time."

### **It's an 'overestimate'**

The social cost of carbon is used in the cost-benefit analysis of some federal regulations. If the impact of emissions is deemed expensive for society, it could justify more aggressive policies to reduce their release by industry. Opponents of climate action criticized the Obama administration for raising the social cost of carbon in 2013 by almost 50 percent.

William Pizer, a Duke University professor and former Obama administration official who has worked on the estimate, applauded the Stanford researchers for applying updated observations into their carbon estimates. He and several other former Obama advisers say the administration should improve its use of updated science when establishing the price.

But Pizer also questioned the methodology of the Stanford analysis. The empirical research it relied on tracked short-term temperature spikes and their impacts on nations' economies -- not long-term trends that might show permanent economic reductions.

"To me, it just seems like it has to be an overestimate," Pizer said of the Stanford result of \$220.

"I think it's great they're doing this," he added. "I just think this is another data point that someone needs to weigh as they're trying to figure out what the right social cost of carbon is. But this isn't like a definitive new answer."

Moore acknowledged the uncertainties in her research. For example, she noted that there's not enough evidence to know if climate change will continue to have outsized impacts on poorer countries or if as their economies grow they'll be able to adapt and decrease their damage.

A grimmer outcome consists of "biophysical temperature thresholds" -- the idea that the heat will prevent large economic advances. Both scenarios effect the speed and aggressiveness with which emissions should be reduced -- and the price of their social cost of carbon.

Moore hopes the new research will help inform the administration that a larger spectrum of damages should be considered when establishing the monetary estimate.

Twitter: [@evanlehmann](https://twitter.com/evanlehmann) | Email: [elehmann@eenews.net](mailto:elehmann@eenews.net)



**From:** Marten, Alex  
**Location:** Al's Conference Room  
**Importance:** Normal  
**Subject:** Accepted: SCC Team Check Meeting - Elizabeth K.  
**Start Date/Time:** Thur 7/23/2015 6:00:00 PM  
**End Date/Time:** Thur 7/23/2015 6:30:00 PM

**To:** Roberts, Martha[Roberts.Martha@epa.gov]  
**From:** Marten, Alex  
**Sent:** Tue 6/30/2015 1:35:24 AM  
**Subject:** Thanks

Thank you for your help with the SCC RTC earlier. I know how busy you are so it really means a lot that you were willing take the time.

--

Alex L. Marten  
phone: (202) 566-2301  
email: marten.alex@epa.gov

**To:** Marten, Alex[Marten.Alex@epa.gov]  
**From:** Griffiths, Charles  
**Sent:** Tue 6/30/2015 11:56:57 PM  
**Subject:** Automatic reply: revised list of SCC panel recommendations

I will be out of the office beginning Monday, June 29, 2015 and will return on Monday, July 6, 2015.

I will not be checking messages and I will not have access to a phone, but I will return your email upon my return. If you need immediate assistance, you may contact my supervisor, Jennifer Bowen, who will help find someone to assist you.

**To:** Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; Barron, Alex[Barron.Alex@epa.gov]  
**Cc:** Marten, Alex[Marten.Alex@epa.gov]; McGartland, Al[McGartland.Al@epa.gov]; Fawcett, Allen[Fawcett.Allen@epa.gov]  
**From:** Shouse, Kate  
**Sent:** Wed 6/17/2015 6:03:03 PM  
**Subject:** RE: SCC Draft Blog 6-16-15\_ek ab.docx

Thanks, everyone, for considering these comments, much appreciated.

**From:** Kopits, Elizabeth  
**Sent:** Wednesday, June 17, 2015 1:07 PM  
**To:** Barron, Alex; Shouse, Kate  
**Cc:** Marten, Alex; McGartland, Al; Fawcett, Allen  
**Subject:** RE: SCC Draft Blog 6-16-15\_ek ab.docx

Hi Alex – I just caught Al on his way to another meeting. He is sympathetic to Kate's concern and votes to use the earlier suggested tweak to the sentence so I am going to send that one forward. He said he could follow up with you later to discuss.

Thanks,

Elizabeth

**From:** Barron, Alex  
**Sent:** Wednesday, June 17, 2015 11:55 AM  
**To:** Kopits, Elizabeth; Shouse, Kate  
**Cc:** Marten, Alex; McGartland, Al  
**Subject:** RE: SCC Draft Blog 6-16-15\_ek ab.docx

# Ex. 5 - Deliberative

**From:** Kopits, Elizabeth  
**Sent:** Wednesday, June 17, 2015 11:44 AM  
**To:** Shouse, Kate; Barron, Alex  
**Cc:** Marten, Alex; McGartland, Al  
**Subject:** RE: SCC Draft Blog 6-16-15\_ek ab.docx  
**Importance:** High

Kate – I see your point. This is the revised text.

**Ex 5**

Alex B- what do you think re: Kate's concern below?

**From:** Shouse, Kate  
**Sent:** Wednesday, June 17, 2015 11:40 AM  
**To:** Kopits, Elizabeth  
**Cc:** Marten, Alex  
**Subject:** Re: SCC Draft Blog 6-16-15\_ek ab.docx

I'm away from my desk and couldn't see redline/comments.

**Ex 5**

**Ex 5**

Sent from my iPhone

On Jun 17, 2015, at 11:37 AM, Kopits, Elizabeth <[Kopits.Elizabeth@epa.gov](mailto:Kopits.Elizabeth@epa.gov)> wrote:

Yes, I agree. Thanks, Alex. I have removed the comment bubble that was just to us, and will send back to Jim now.



Elizabeth

**From:** Marten, Alex  
**Sent:** Wednesday, June 17, 2015 11:31 AM  
**To:** Barron, Alex; Kopits, Elizabeth; Shouse, Kate  
**Cc:** McGartland, Al; Fawcett, Allen  
**Subject:** RE: SCC Draft Blog 6-16-15\_ek ab.docx

fwiw I am OK with this ending for the second paragraph.

--

Alex L. Marten  
phone: (202) 566-2301  
email: marten.alex@epa.gov

**From:** Barron, Alex  
**Sent:** Wednesday, June 17, 2015 11:23 AM  
**To:** Kopits, Elizabeth; Shouse, Kate; Marten, Alex  
**Cc:** McGartland, Al; Fawcett, Allen  
**Subject:** SCC Draft Blog 6-16-15\_ek ab.docx

A few minor edits (including adding some clarification into existing bubbles). If this looks okay to everyone, I would send back our feedback as Joel is out of pocket for the morning. Also feel free to call if there are questions.

Still waiting for details on timing.

Alex

**To:** Shouse, Kate[Shouse.Kate@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]  
**Cc:** McGartland, Al[McGartland.Al@epa.gov]; Barron, Alex[Barron.Alex@epa.gov]  
**From:** Kopits, Elizabeth  
**Sent:** Mon 6/15/2015 7:05:24 PM  
**Subject:** RE: 2015 06 15 Desk statement and QA on use of Marten et al 2014 in RIAs  
2015 06 15 Desk statement and QA on use of Marten et al 2014 in RIAs.docx

Good catch Kate, thanks!

-----Original Message-----

From: Shouse, Kate  
Sent: Monday, June 15, 2015 1:58 PM  
To: Marten, Alex  
Cc: Kopits, Elizabeth  
Subject: RE: 2015 06 15 Desk statement and QA on use of Marten et al 2014 in RIAs

# Ex. 5 - Deliberative

---

From: Marten, Alex  
Sent: Monday, June 15, 2015 12:52 PM  
To: Kopits, Elizabeth; Barron, Alex  
Cc: Shouse, Kate; McGartland, Al  
Subject: RE: 2015 06 15 Desk statement and QA on use of Marten et al 2014 in RIAs

This looks good to me. Thanks.

--

Alex L. Marten  
phone: (202) 566-2301<tel:%28202%29%20566-2301>  
email: marten.alex@epa.gov<mailto:marten.alex@epa.gov>

From: Kopits, Elizabeth  
Sent: Monday, June 15, 2015 12:43 PM  
To: Barron, Alex; Marten, Alex  
Cc: Shouse, Kate; McGartland, Al  
Subject: 2015 06 15 Desk statement and QA on use of Marten et al 2014 in RIAs

OK sounds good. I deleted Q13a, and added a minor fix to Q2 to make it clearer. I'm not sure if Kate or Alex M have any comments, but attached is the clean current version.

Thanks,  
Elizabeth

From: Barron, Alex  
Sent: Monday, June 15, 2015 11:55 AM  
To: Kopits, Elizabeth; Marten, Alex

Cc: Shouse, Kate; McGartland, Al

Subject: RE: 2015 06 12 Desk statement and QA on use of Marten et al 2014 in RIAs ab.docx

I would hold back Q13 until we need it. We should chat about some of the procedural pieces, but in principle pointing to landfills works for me. On Q2, I was searching for some way to make clear that other Agencies will have had a chance to provide their input on the use of Marten et al.

Alex

From: Kopits, Elizabeth

Sent: Monday, June 15, 2015 11:42 AM

To: Barron, Alex; Marten, Alex

Cc: Shouse, Kate; McGartland, Al

Subject: RE: 2015 06 12 Desk statement and QA on use of Marten et al 2014 in RIAs ab.docx

Thanks, Alex. Here are revisions in response to your comments (I accepted all your edits first), and a couple outstanding questions.

Elizabeth

From: Barron, Alex

Sent: Monday, June 15, 2015 10:47 AM

To: Kopits, Elizabeth; Marten, Alex

Subject: 2015 06 12 Desk statement and QA on use of Marten et al 2014 in RIAs ab.docx

**To:** Marsh, Karen[Marsh.Karen@epa.gov]; Thundiyil, Karen[Thundiyil.Karen@epa.gov]  
**Cc:** Ward, Hillary[Ward.Hillary@epa.gov]; Fulcher, Charles[Fulcher.Charles@epa.gov]; Shouse, Kate[Shouse.Kate@epa.gov]; Barron, Alex[Barron.Alex@epa.gov]; McGartland, Al[McGartland.Al@epa.gov]; Moore, Chris[Moore.Chris@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]  
**From:** Kopits, Elizabeth  
**Sent:** Tue 6/9/2015 12:22:31 PM  
**Subject:** suggestions for shortening benefits language for Landfills EG  
2015 06 08 EO 12866 Landfills EG 2060 AS23 NPRM 20150522\_preamblerule\_ek\_shorter alm\_ek.docx

Hi Karen,

Not sure if you have already received this through other channels (I think Alex B. was trying to reach Peter T. yesterday), but we had a chance to discuss the status of the landfills benefits language with Joel and he had two suggestions:

## Ex. 5 - Deliberative

Hope this helps. Please feel free to call me with any questions etc.

Thanks!

Elizabeth

Elizabeth Kopits, Ph.D.

National Center for Environmental Economics

Office of Policy, US EPA

1200 Pennsylvania Ave, NW, MC 1809T

Washington, DC 20460

(202) 566-2299

**From:** Marsh, Karen

**Sent:** Thursday, June 04, 2015 3:01 PM

**To:** Thundiyil, Karen

**Cc:** Ward, Hillary; Fulcher, Charles; Shouse, Kate; Kopits, Elizabeth

**Subject:** Updated benefits language for Landfills NSPS

Karen,

Attached is the updated version of the benefits language for the Landfills NSPS. This language will go immediately following Table 1 in the preamble. This is more in line with the amount of detail needed for the preamble. Please review this language and let me know if you have any additional comments or edits. Once we receive those edits we can finalize the package and have it sent back through the proper channels for submittal to OMB.

Thanks,

Karen

\*\*\*\*\*

Karen R. Marsh, PE

US EPA, OAQPS, Sectors Policies and Programs Division

Fuels and Incineration Group

109 TW Alexander Drive, Mail Code E143-05

Research Triangle Park, NC 27711

Direct: (919) 541-1065; email: [marsh.karen@epa.gov](mailto:marsh.karen@epa.gov)



**To:** Laity, Jim[[EOP email/phone](#)]; Marten, Alex[Marten.Alex@epa.gov]; Barron, Alex[Barron.Alex@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]  
**From:** Linn, Joshua  
**Sent:** Fri 5/22/2015 1:01:53 AM  
**Subject:** Re: Draft Final SCC Documents

Thanks, Alex. I'll use this version.

**From:** Laity, Jim  
**Sent:** Thursday, May 21, 2015 08:36 PM  
**To:** Marten, Alex <Marten.Alex@epa.gov>; Barron, Alex <Barron.Alex@epa.gov>; Kopits, Elizabeth <Kopits.Elizabeth@epa.gov>  
**Cc:** Linn, Joshua  
**Subject:** RE: Draft Final SCC Documents

Thx Alex. Good catches.

Josh, Please use this version which accepts Alex's edits. Jim

**From:** Marten, Alex [mailto:Marten.Alex@epa.gov]  
**Sent:** Thursday, May 21, 2015 8:09 PM  
**To:** Laity, Jim; Barron, Alex; Kopits, Elizabeth  
**Cc:** Linn, Joshua  
**Subject:** Re: Draft Final SCC Documents

**Ex 5**

Thanks.

--

Alex Marten

[marten.alex@epa.gov](mailto:marten.alex@epa.gov)

---

**From:** Laity, Jim <[REDACTED] EOP email/phone>  
**Sent:** Thursday, May 21, 2015 7:15 PM  
**To:** Marten, Alex; Barron, Alex; Kopits, Elizabeth  
**Cc:** Linn, Joshua  
**Subject:** Draft Final SCC Documents

Alex2 and Elizabeth: Here are the documents we intend to distribute tomorrow. [REDACTED] Ex 5

**Ex 5**

Ex 5

I will be out tomorrow but Josh will be handling the call and IWG distribution. Jim



**To:** Laity, Jim [EOP email/phone]; Barron, Alex[Barron.Alex@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]  
**Cc:** Linn, Joshua [EOP email/phone]  
**From:** Marten, Alex  
**Sent:** Fri 5/22/2015 12:08:37 AM  
**Subject:** Re: Draft Final SCC Documents  
2015 05 22 SCC RtC - alm.docx

# Ex 5

Thanks.

--  
Alex Marten  
marten.alex@epa.gov

---

**From:** Laity, Jim [EOP email/phone]  
**Sent:** Thursday, May 21, 2015 7:15 PM  
**To:** Marten, Alex; Barron, Alex; Kopits, Elizabeth  
**Cc:** Linn, Joshua  
**Subject:** Draft Final SCC Documents

Alex2 and Elizabeth: Here are the documents we intend to distribute tomorrow. [EOP email/phone]

## Ex 5

[EOP email/phone] I will be out tomorrow but Josh will be handling the call and IWG distribution. Jim

**To:** Barron, Alex[Barron.Alex@epa.gov]  
**Cc:** McGartland, Al[McGartland.Al@epa.gov]  
**From:** Marten, Alex  
**Sent:** Mon 4/6/2015 5:26:58 PM  
**Subject:** FW: if we can make edits  
non CO2 (04 06 15).docx

Alex,

Have you heard anything from EOP about the timing of the RTC?

**Ex 5**

Of course if you think this edit isn't worth

**Ex 5**

**Ex 5** I'm fine w/ that also.

--

Alex L. Marten  
phone: (202) 566-2301  
email: [marten.alex@epa.gov](mailto:marten.alex@epa.gov)

**From:** Shouse, Kate  
**Sent:** Monday, April 06, 2015 1:21 PM  
**To:** Marten, Alex  
**Subject:** if we can make edits

**Ex 5**

She flagged a different sentence

and wondered if we could make the edit

**Ex 5**

**Ex 5**

Thanks,  
Kate

**To:** Barron, Alex[Barron.Alex@epa.gov]  
**From:** Marten, Alex  
**Sent:** Fri 2/6/2015 2:24:43 AM  
**Subject:** Fw: Next Version of RtC  
2015 02 05 SCC RTC OIRA-CEA-EPA redline v3.docx

Alex,

For your records. Jim didn't have time to work on the RTC tonight so I did a bunch of cleanup and resent him an updated version. I addressed most of your requests but a few will have to get deal w/ during the IWG comment period, don't want you to think I dropped them. Below is my todo list for the RTC.

RTC Todo:

**Ex 5**

Response to AB comment:

**Ex 5**

# Ex 5

--

Alex Marten  
marten.alex@epa.gov

---

**From:** Marten, Alex  
**Sent:** Thursday, February 5, 2015 9:18 PM  
**To:** Laity, Jim  
**Cc:** Linn, Joshua  
**Subject:** Re: Next Version of RtC

The attached version should be notably cleaner. Well at least in terms of a single set of comments from us.

If anything is still conflicting please let me know.

Thanks.

--

Alex Marten  
marten.alex@epa.gov  
202-566-2301

---

**From:** Laity, Jim <EOP email/phone>  
**Sent:** Thursday, February 5, 2015 6:38 PM  
**To:** Marten, Alex  
**Subject:** RE: Next Version of RtC

Thx

**From:** Marten, Alex [mailto:Marten.Alex@epa.gov]  
**Sent:** Thursday, February 05, 2015 6:08 PM  
**To:** Laity, Jim  
**Cc:** McGartland, Al; Gunning, Paul; Linn, Joshua; Shouse, Kate; Barron, Alex

**Subject:** RE: Next Version of RtC

Attached are our comments. My hope is that nothing got messed up in the merge but it sounds like it would be better to get these to you now, rather than waiting to QA/QC that process.

Please let us know if you have any questions.

--

Alex L. Marten  
phone: (202) 566-2301  
email: [marten.alex@epa.gov](mailto:marten.alex@epa.gov)

**From:** Laity, Jim [mailto:[EOP email/phone](#)]  
**Sent:** Thursday, February 05, 2015 5:47 PM  
**To:** Marten, Alex; Barron, Alex  
**Cc:** McGartland, Al; Gunning, Paul; Linn, Joshua  
**Subject:** RE: Next Version of RtC

EPA/CEA: Are you planning to get me any more comments tonight? I can't stay very late, so the sooner the better. Ex 5

**Ex 5**

**From:** Laity, Jim  
**Sent:** Wednesday, February 04, 2015 10:42 PM  
**To:** 'Marten, Alex'; Barron, Alex  
**Cc:** McGartland, Al; Gunning, Paul; Linn, Joshua  
**Subject:** Next Version of RtC

Hi Team: Attached is a redline relative to the last version you sent us, plus a clean version that accepts all changes in the redline. Ex 5

**Ex 5**

For the "clean" version, all the comments are preserved, but the redline is removed.

Please get this back to me by cob tomorrow if possible. I have not done a final "read through" of the clean; I will work on that tomorrow. I welcome any additional edits, as well as answers to my marginal questions. We can also set up a call if you want to discuss anything. Jim

**To:** Marten, Alex[Marten.Alex@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; Wolverton, Ann[Wolverton.Ann@epa.gov]; Newbold, Steve[Newbold.Steve@epa.gov]; Li, Jia[Li.Jia@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]; McGartland, Al[McGartland.Al@epa.gov]; Barron, Alex[Barron.Alex@epa.gov]; Gunning, Paul[Gunning.Paul@epa.gov]  
**Cc:** Kime, Robin[Kime.Robin@epa.gov]; Means-Thomas, Janet[Means-Thomas.Janet@epa.gov]  
**From:** Poole, Jacqueline  
**Sent:** Fri 1/30/2015 2:36:06 PM  
**Subject:** RE: SCC Interagency Working Group Meeting Feb 6, 11am-12pm, EEOB [Ex 6 - Other]

Hi All:

Please send your WAVE's information to

**EOP email/phone**

**From:** Linn, Joshua [Ex 6 - Other]  
**Sent:** Friday, January 30, 2015 9:25 AM  
**To:** Poole, Jacqueline  
**Cc:** Kime, Robin; Means-Thomas, Janet; Goldstein, Jeff  
**Subject:** RE: SCC Interagency Working Group Meeting Feb 6, 11am-12pm, EEOB [Ex 6 - Other]

Certainly. Please send any other clearance information to Jeff Goldstein, who is cc'd on this email.

**From:** Poole, Jacqueline [mailto:Poole.Jacqueline@epa.gov]  
**Sent:** Friday, January 30, 2015 9:21 AM  
**To:** Linn, Joshua  
**Cc:** Kime, Robin; Means-Thomas, Janet  
**Subject:** RE: SCC Interagency Working Group Meeting Feb 6, 11am-12pm, EEOB [Ex 6 - Other]

-----Original Appointment-----

**From:** Linn, Joshua [Ex 6 - Other]  
**Sent:** Thursday, January 29, 2015 7:10 PM  
**To:** Linn, Joshua; Marten, Alex; Sarofim, Marcus; Mignone, Bryan; pduffy@usgcrp.gov; Schwab, Margo; Kopits, Elizabeth; Wolverton, Ann; Newbold, Steve; Li, Jia; Shouse, Kate; Johansson, Robert - OCE; Thomas, Amanda; Griffiths, Charles; Elke.Hodson@hq.doe.gov



Arthur.Rypinski@dot.gov; Mancini, Dominic J.; Duke, Rick; Bruce D Rodan; EOP email/phone  
Holdren, John P.; Utech, Dan G.; McConville, Drew; McGartland, Al; Barron, Alex; Gunning,  
Paul; SHelper@doc.gov; PFeather@oce.usda.gov; William.Hohenstein@usda.gov;  
james\_anderson@ios.doi.gov; aevia@blm.gov; Simon, Bob; Jencks, Fac; Higgins, Courtney;  
jonathan.pershing@hq.doe.gov; Laity, Jim; Obstfeld, Maurice; Shelanski, Howard; Goldstein,  
Jeff; Himel, Sam  
**Subject:** SCC Interagency Working Group Meeting Feb 6, 11am-12pm, EEOB  
**When:** Friday, February 06, 2015 11:00 AM-12:00 PM (UTC-05:00) Eastern Time (US &  
Canada).  
**Where:** EEOB Ex 6 - Other

Dear members of the SCC Interagency Working Group:

We will have a meeting for all working group members from **11am-12pm on February 6**, in  
**EEOB** Ex 6 - Other There will be  
two major topics on the agenda:

**Ex 5**

We are extremely thankful to the members of the sub-groups who read and summarized the  
public comments, and particularly to Elizabeth Kopits for her leadership in pulling together the  
subgroups and melding the responses into a coherent document. Based on the summaries we  
received from the sub-groups a small team has drafted a response to the comments. Ex 5

**Ex 5**

**Ex 5**

## Ex 5

Ex 5 We look forward to seeing everyone next week.

Finally, please submit WAVES requests to Jeff Goldstein

**EOP email/phone**

Best,

Jim Laity and Josh Linn

**To:** Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; Shouse, Kate[Shouse.Kate@epa.gov]  
**Cc:** Marten, Alex[Marten.Alex@epa.gov]; McGartland, Al[McGartland.Al@epa.gov]  
**From:** Barron, Alex  
**Sent:** Wed 6/17/2015 3:55:21 PM  
**Subject:** RE: SCC Draft Blog 6-16-15\_ek ab.docx

## Ex 5

Al?

**From:** Kopits, Elizabeth  
**Sent:** Wednesday, June 17, 2015 11:44 AM  
**To:** Shouse, Kate; Barron, Alex  
**Cc:** Marten, Alex; McGartland, Al  
**Subject:** RE: SCC Draft Blog 6-16-15\_ek ab.docx  
**Importance:** High

Kate – I see your point. This is the revised text.

## Ex 5

Alex B- what do you think re: Kate's concern below?

**From:** Shouse, Kate  
**Sent:** Wednesday, June 17, 2015 11:40 AM  
**To:** Kopits, Elizabeth  
**Cc:** Marten, Alex  
**Subject:** Re: SCC Draft Blog 6-16-15\_ek ab.docx

I'm away from my desk and couldn't see redline/comments. Re the 2nd paragraph, does that

# Ex 5

Sent from my iPhone

On Jun 17, 2015, at 11:37 AM, Kopits, Elizabeth <[Kopits.Elizabeth@epa.gov](mailto:Kopits.Elizabeth@epa.gov)> wrote:

Yes, I agree. Thanks, Alex. I have removed the comment bubble that was just to us, and will send back to Jim now.

Elizabeth

**From:** Marten, Alex  
**Sent:** Wednesday, June 17, 2015 11:31 AM  
**To:** Barron, Alex; Kopits, Elizabeth; Shouse, Kate  
**Cc:** McGartland, Al; Fawcett, Allen  
**Subject:** RE: SCC Draft Blog 6-16-15\_ek ab.docx

fwiw I am OK with this ending for the second paragraph.

--

Alex L. Marten  
phone: (202) 566-2301  
email: [marten.alex@epa.gov](mailto:marten.alex@epa.gov)

**From:** Barron, Alex  
**Sent:** Wednesday, June 17, 2015 11:23 AM  
**To:** Kopits, Elizabeth; Shouse, Kate; Marten, Alex  
**Cc:** McGartland, Al; Fawcett, Allen  
**Subject:** SCC Draft Blog 6-16-15\_ek ab.docx

A few minor edits (including adding some clarification into existing bubbles). If this looks

okay to everyone, I would send back our feedback as Joel is out of pocket for the morning.  
Also feel free to call if there are questions.

Still waiting for details on timing.

Alex

**To:** Beauvais, Joel[Beauvais.Joel@epa.gov]; McGartland, Al[McGartland.Al@epa.gov]  
**Cc:** Kime, Robin[Kime.Robin@epa.gov]  
**From:** Kopits, Elizabeth  
**Sent:** Mon 1/5/2015 8:26:27 PM  
**Subject:** RE: SCC - I will send you latest staff draft of charge within a couple of hours

Ok, sounds good. I just left Josh a message, and I will try to have some draft ideas for the RTC language before we meet tomorrow too.

Elizabeth

**From:** Beauvais, Joel  
**Sent:** Monday, January 05, 2015 3:20 PM  
**To:** Kopits, Elizabeth; McGartland, Al  
**Cc:** Kime, Robin  
**Subject:** RE: SCC - I will send you latest staff draft of charge within a couple of hours

Thanks, Elizabeth. I'll review and bring comments/questions to the meeting.

I spoke to Howard and Dom over the break about the RTC and an interagency mtg but think it would be good for you to connect with Jim and Josh as well.

The other thing that might be helpful to have is any thoughts you have on Ex 5  
Ex 5 No worries  
if you can't have by tomorrow, but if you could, we could discuss.

Joel

**From:** Kopits, Elizabeth  
**Sent:** Monday, January 05, 2015 3:11 PM

**To:** McGartland, Al; Beauvais, Joel  
**Cc:** Kime, Robin  
**Subject:** RE: SCC - I will send you latest staff draft of charge within a couple of hours

Hi Joel,

Yes, a meeting tomorrow would be great! Attached is the current draft charge. It includes comments and edits from the full NCEE SCC team and CEB staff (Kate, Jia, and general feedback from Allen). Al is reviewing it concurrently with you. Per Al's suggestion, I will also send it along to Jim D now.

Also attached is a draft outline of the discussion document that we could provide to the NRC committee to help inform their discussion and review of the charge questions.

Please let me know if there is anything else I can do before we meet. Would you like me to check in with Josh and/or Jim and ask about their plans for scheduling the next interagency meeting? It seems like at least one meeting would be very helpful/needed in January, if the project is going to be on the agenda at the next NRC meeting (Feb 12-13).

Thanks,

Elizabeth

**From:** McGartland, Al  
**Sent:** Monday, January 05, 2015 2:52 PM  
**To:** Beauvais, Joel  
**Cc:** Kopits, Elizabeth; Kime, Robin  
**Subject:** Re: SCC - I will send you latest staff draft of charge within a couple of hours

I'm sure we agree a quick meeting would be very useful.

Sent from my iPhone

On Jan 5, 2015, at 2:04 PM, Beauvais, Joel <[Beauvais.Joel@epa.gov](mailto:Beauvais.Joel@epa.gov)> wrote:

Thanks, Elizabeth. I reviewed the draft you provided me before the holidays and have comments, but will hold those until I see the updated draft.

I would like to connect with you guys on process, as well as talk through a few elements of the charge to better understand the substance. I think it might make sense for us to get together tomorrow or Wednesday for a half hour if that would be possible. OK with you guys?

Joel

**From:** Kopits, Elizabeth

**Sent:** Monday, January 05, 2015 1:07 PM

**To:** Beauvais, Joel

**Cc:** McGartland, Al

**Subject:** SCC - I will send you latest staff draft of charge within a couple of hours

Hi Joel,

Happy New Year! I just talked with Al and he mentioned he talked to you about SCC. I am just in the process of incorporating some final (NCEE and CEB) staff level comments/edits on the draft charge, so I will send you the latest version within the next couple of hours.

Thanks,

Elizabeth



**To:** McGartland, Al[McGartland.Al@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]  
**From:** Beauvais, Joel  
**Sent:** Fri 1/9/2015 2:57:58 PM  
**Subject:** Re: SCC - NAS draft charge

You can go ahead and send this forward to OIRA and CEA in prep for the meeting next Friday.  
Thx.

On Jan 9, 2015, at 9:54 AM, Gunning, Paul <[Gunning.Paul@epa.gov](mailto:Gunning.Paul@epa.gov)> wrote:

Joel – just got confirmation that both Joe and Janet are fine with this. Good to go from our end.

Paul

**From:** Beauvais, Joel  
**Sent:** Wednesday, January 07, 2015 11:18 AM  
**To:** Kopits, Elizabeth; McGartland, Al  
**Cc:** Newbold, Steve; Griffiths, Charles; Marten, Alex; Wolverton, Ann; Li, Jia; Shouse, Kate; Fawcett, Allen; DeMocker, Jim; Gunning, Paul  
**Subject:** RE: SCC - NAS draft charge

Thanks, Elizabeth and company. This looks good to me. I flagged for Joe as well. As soon

**Ex 5**

Joel

**From:** Kopits, Elizabeth  
**Sent:** Wednesday, January 07, 2015 10:59 AM  
**To:** Beauvais, Joel; McGartland, Al  
**Cc:** Newbold, Steve; Griffiths, Charles; Marten, Alex; Wolverton, Ann; Li, Jia; Shouse,

Kate; Fawcett, Allen; DeMocker, Jim; Gunning, Paul  
**Subject:** SCC - NAS draft charge

Hi Joel and Al,

Attached is the revised NAS draft charge, reflecting the edits we discussed yesterday – and NCEE-CEB staff feedback on those edits. I just spoke to Allen and he is sending this version up their chain for Joe and Janet's feedback.

Please let me know if you would like to discuss and/or have any other edits.

Thanks,

Elizabeth

**To:** Heninger, Brian[Heninger.Brian@epa.gov]  
**Cc:** Griffiths, Charles[Griffiths.Charles@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]  
**From:** Matthew Ranson  
**Sent:** Tue 2/10/2015 6:43:49 PM  
**Subject:** RE: Working draft of extreme weather report

Hi Brian,

Thanks for the comments! We're happy to clean up the next version of the document so that you can more easily review. Two weeks sounds good--we'll plan to send you something on Monday, Feb 23.

Thanks,

Matt

**Matthew Ranson, Ph.D | Associate | Abt Associates**

55 Wheeler Street | Cambridge, MA 02138

O: 617.520.2484 | F: 617.386.7568 | [www.abtassociates.com/environment](http://www.abtassociates.com/environment)

**From:** Heninger, Brian [mailto:Heninger.Brian@epa.gov]  
**Sent:** Monday, February 09, 2015 3:43 PM  
**To:** Matthew Ranson  
**Cc:** Griffiths, Charles; Marten, Alex  
**Subject:** RE: Working draft of extreme weather report

Hi Matt,

Attached is your version from today with some additional comments from Charles (on first 24 pages.) You seem to be going in the right direction, so there does not appear to be a need to talk tomorrow. However, at some point, (say 2 weeks) you could send us another draft when you are further along and delete some of the comments previously made, so that we can read a cleaner version.

Let me know if you have any questions.

Enjoy the snow, -Brian

-----

Brian Heninger

Economist / OP Quality Assurance Manager

U.S. Environmental Protection Agency

Office of the Administrator, Office of Policy (OP)

National Center for Environmental Economics

202-566-2270

**From:** Matthew Ranson [[mailto:Matthew\\_Ranson@abtassoc.com](mailto:Matthew_Ranson@abtassoc.com)]

**Sent:** Monday, February 09, 2015 11:12 AM

**To:** Heninger, Brian

**Subject:** SCC: Working draft of extreme weather report

Hi Brian,

I'm attaching our current working draft of the extreme weather report. Relative to the draft I

**Ex 5**

**Ex 5**

There is a lot of material here, and we're making good progress, but it's still very much a messy half-written document. So, while we would certainly welcome your comments and suggestions, it would probably be most productive for you to focus your review on high-level items.

Our office is closed today due to heavy snow. I'm assuming that we're planning to talk tomorrow at 10, but if we have a snow delay tomorrow, I'll email you by 9am so we can

reschedule our call. And if you would prefer to wait another two weeks before you assemble the full team for a meeting, that would be fine too.

Thanks,

Matt

**Matthew Ranson, Ph.D | Associate | Abt Associates**

55 Wheeler Street | Cambridge, MA 02138

O: 617.520.2484 | F: 617.386.7568 | [www.abtassociates.com/environment](http://www.abtassociates.com/environment)

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**To:** Heninger, Brian[Heninger.Brian@epa.gov]  
**Cc:** Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]  
**From:** Matthew Ranson  
**Sent:** Thur 1/22/2015 6:04:03 PM  
**Subject:** RE: Quick update on extreme weather work

Hi Brian,

Sure, that works for us. I'll be in touch on Monday.

Thanks,

Matt

**Matthew Ranson, Ph.D | Associate | Abt Associates**

55 Wheeler Street | Cambridge, MA 02138

O: 617.520.2484 | F: 617.386.7568 | [www.abtassociates.com/environment](http://www.abtassociates.com/environment)

**From:** Heninger, Brian [mailto:Heninger.Brian@epa.gov]  
**Sent:** Thursday, January 22, 2015 11:39 AM  
**To:** Matthew Ranson  
**Cc:** Kopits, Elizabeth; Marten, Alex; Griffiths, Charles  
**Subject:** RE: Quick update on extreme weather work

Hi Matt,

Thanks for the update. This sounds fine.

Why don't you send us your draft Monday as you stated below. Then, unless you have a need to, let's skip talking on Tuesday 1/27, and you guys just keep moving forward. The after reviewing your draft, we will e-mail you any comments and respond to any questions raised in your draft.

Sound good?

Thanks, -Brian

-----  
Brian Heninger

Economist / OP Quality Assurance Manager

U.S. Environmental Protection Agency

Office of the Administrator, Office of Policy (OP)

National Center for Environmental Economics

202-566-2270

**From:** Matthew Ranson [[mailto:Matthew\\_Ranson@abtassoc.com](mailto:Matthew_Ranson@abtassoc.com)]

**Sent:** Thursday, January 22, 2015 9:51 AM

**To:** Heninger, Brian; Kopits, Elizabeth; Marten, Alex; Griffiths, Charles

**Subject:** SCC: Quick update on extreme weather work

Hi all,

Just wanted to give you a quick update on the extreme weather work.

**Ex 5**

**Ex 5**

To help move things along, Audrey Lew, an RA here at Abt, is joining our project team. Audrey has a B.S. in geology/chemistry from Brown University, and is working initially on the

**Ex 5**

of the report.

Our goal is to get a full draft of the **Ex 5** quickly, and then to get your feedback on both the layout and content. It's a substantial piece of work, so it won't be complete by our call next week, but I'll still send you our working draft on Monday so you can at least see where we're heading.

Thanks,

Matt

**Matthew Ranson, Ph.D | Associate | Abt Associates**

55 Wheeler Street | Cambridge, MA 02138

O: 617.520.2484 | F: 617.386.7568 | [www.abtassociates.com/environment](http://www.abtassociates.com/environment)

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**To:** Griffiths, Charles[Griffiths.Charles@epa.gov]; Heninger, Brian[Heninger.Brian@epa.gov];  
Marten, Alex[Marten.Alex@epa.gov]  
**From:** Kopits, Elizabeth  
**Sent:** Thur 1/22/2015 4:14:45 PM  
**Subject:** RE: Quick update on extreme weather work

I agree too. Thanks!

**From:** Griffiths, Charles  
**Sent:** Thursday, January 22, 2015 11:10 AM  
**To:** Heninger, Brian; Kopits, Elizabeth; Marten, Alex  
**Subject:** RE: Quick update on extreme weather work

**Ex 5**

Charles

\*\*\*\*\*

Charles Griffiths  
National Center for Environmental Economics  
Room 4334B, WJC West, Mail Code 1809T  
U.S. Environmental Protection Agency  
1200 Pennsylvania Avenue, N.W.  
Washington, D.C. 20460  
Phone: 202/566-2288 Fax: 202/566-2338  
Email: [griffiths.charles@epamail.epa.gov](mailto:griffiths.charles@epamail.epa.gov)

\*\*\*\*\*

**From:** Heninger, Brian  
**Sent:** Thursday, January 22, 2015 10:15 AM  
**To:** Griffiths, Charles; Kopits, Elizabeth; Marten, Alex  
**Subject:** FW: Quick update on extreme weather work

Hi Folks,

**Ex 5**

-BH

**From:** Matthew Ranson [[mailto:Matthew\\_Ranson@abtassoc.com](mailto:Matthew_Ranson@abtassoc.com)]  
**Sent:** Thursday, January 22, 2015 9:51 AM  
**To:** Heninger, Brian; Kopits, Elizabeth; Marten, Alex; Griffiths, Charles  
**Subject:** SCC: Quick update on extreme weather work

Hi all,

Just wanted to give you a quick update on the extreme weather work.

**Ex 5**

**Ex 5**

To help move things along, Audrey Lew, an RA here at Abt, is joining our project team. Audrey has a B.S. in geology/chemistry from Brown University, and is working initially on the landslides and avalanches section of the report.

Our goal is to get a full draft of the tropical cyclones section done fairly quickly, and then to get your feedback on both the layout and content. It's a substantial piece of work, so it won't be complete by our call next week, but I'll still send you our working draft on Monday so you can at least see where we're heading.

Thanks,

Matt

**Matthew Ranson, Ph.D | Associate | Abt Associates**

55 Wheeler Street | Cambridge, MA 02138

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**To:** Beauvais, Joel[Beauvais.Joel@epa.gov]; McGartland, Al[McGartland.Al@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]  
**Cc:** Kime, Robin[Kime.Robin@epa.gov]  
**From:** Kopits, Elizabeth  
**Sent:** Mon 6/22/2015 7:05:12 PM  
**Subject:** RE: SCC

I just chatted with Jim. It sounds like the blog is in Howard's court **Ex 6 - Other** and it is **Ex 5** on timing.

Elizabeth

**From:** Kopits, Elizabeth  
**Sent:** Monday, June 22, 2015 2:42 PM  
**To:** Beauvais, Joel; McGartland, Al; Marten, Alex  
**Cc:** Kime, Robin  
**Subject:** RE: SCC

Yes, of course, will do. I chatted briefly with Josh this morning but he had no updates to share on timing or revised blog. I will try to check in with Jim before the end of the day.

Thanks,

Elizabeth

**From:** Beauvais, Joel  
**Sent:** Monday, June 22, 2015 2:39 PM  
**To:** McGartland, Al; Kopits, Elizabeth; Marten, Alex  
**Cc:** Kime, Robin  
**Subject:** SCC

Hi, folks – Can you keep me posted on any new info as it becomes available regarding materials for, or timing of, the SCC RTC etc. announcement? I will stay in touch with Katie and Rick Duke on this and will keep you posted on anything I hear, but now that Alex B has left the bldg,

please stay in touch with me directly on this.

Joel

**To:** Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]  
**Cc:** McGartland, Al[McGartland.Al@epa.gov]; Kime, Robin[Kime.Robin@epa.gov]  
**From:** Beauvais, Joel  
**Sent:** Tue 1/13/2015 4:27:52 PM  
**Subject:** Re: SCC - NAS draft charge

Yes please - good catch and thanks

On Jan 13, 2015, at 11:14 AM, Kopits, Elizabeth <Kopits.Elizabeth@epa.gov> wrote:

Hi Joel,

Sorry to bother you with this, but I just got an email from Kate Shouse in OAP asking whether there is an SCC meeting this week (below). This leads me to think that no one from OAR knows about the Friday meeting. Did you want to add anyone from OAP (e.g., Allen and/or Paul)? If so, would you like me to take care of it?

Elizabeth

**From:** Shouse, Kate  
**Sent:** Tuesday, January 13, 2015 10:45 AM  
**To:** Kopits, Elizabeth  
**Subject:** FW: SCC - NAS draft charge

Hi, Elizabeth. Just wanted to check in and see whether any meetings have been scheduled for this week (sounded like that was goal). I'm on a full-time schedule now, working M-F, with telework days TBD.

Thanks for checking back with Andy and Jonathan.

**Ex 6 - Other**

**Ex 6 - Other**

**From:** Beauvais, Joel  
**Sent:** Wednesday, January 07, 2015 11:18 AM  
**To:** Kopits, Elizabeth; McGartland, Al  
**Cc:** Newbold, Steve; Griffiths, Charles; Marten, Alex; Wolverton, Ann; Li, Jia; Shouse, Kate; Fawcett, Allen; DeMocker, Jim; Gunning, Paul  
**Subject:** RE: SCC - NAS draft charge

Thanks, Elizabeth and company. This looks good to me. I flagged for Joe as well. As soon

**Ex 5**

Joel

**From:** Kopits, Elizabeth  
**Sent:** Wednesday, January 07, 2015 10:59 AM  
**To:** Beauvais, Joel; McGartland, Al  
**Cc:** Newbold, Steve; Griffiths, Charles; Marten, Alex; Wolverton, Ann; Li, Jia; Shouse, Kate; Fawcett, Allen; DeMocker, Jim; Gunning, Paul  
**Subject:** SCC - NAS draft charge

Hi Joel and Al,

Attached is the revised NAS draft charge, reflecting the edits we discussed yesterday – and NCEE-CEB staff feedback on those edits. I just spoke to Allen and he is sending this version up their chain for Joe and Janet's feedback.

Please let me know if you would like to discuss and/or have any other edits.

Thanks,

Elizabeth





**To:** Griffiths, Charles[Griffiths.Charles@epa.gov]  
**Cc:** Newbold, Steve[Newbold.Steve@epa.gov]; Wolverton, Ann[Wolverton.Ann@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]  
**From:** Heninger, Brian  
**Sent:** Tue 2/3/2015 6:30:06 PM  
**Subject:** Abt's SCC Work

Hi Charles,

I did talk to Matt at Abt briefly today, and he was actually still digging out his car from last night's snow at 10am, so he was not available this morning anyway. I let him know that

**Ex 6 - Other**

He is having his monthly check-in with Mike Fischer on this project today, so we just touched base on a couple items.

**Schedule and Direction:**

**Ex 5**

Let me know if you have any questions or concerns.

-Brian

-----  
Brian Heninger

Economist / OP Quality Assurance Manager

U.S. Environmental Protection Agency

Office of the Administrator, Office of Policy (OP)

National Center for Environmental Economics

202-566-2270

**To:** Griffiths, Charles[Griffiths.Charles@epa.gov]  
**Cc:** Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]  
**From:** Heninger, Brian  
**Sent:** Mon 1/5/2015 6:28:50 PM  
**Subject:** RE: Extreme weather report draft

Charles, Assuming your meeting with Joel has not been moved, I will ask Abt to talk to us at 10:30 -11:00 tomorrow instead of 10:00.

Anyone who has a problem with this new time, please get back to me by 2:30 today.

Thanks, -Brian

PS – Can we use your office Charles? (-:

**From:** Griffiths, Charles  
**Sent:** Friday, January 02, 2015 11:22 AM  
**To:** Heninger, Brian  
**Cc:** Kopits, Elizabeth; Marten, Alex  
**Subject:** RE: Extreme weather report draft

Hi Brian:

Thanks for confirming this meeting with Matt. Unfortunately, on Wednesday Joel re-scheduled a meeting that I am supposed to attend for 9:45-10:15 on Tuesday. I was wondering if there was any chance we could ask Matt and Lisa to meet at 10:30 rather than 10:00? If not, than I can come directly to the meeting with Matt after the meeting with Joel.

If you decide to ask them to move the meeting, we may want to wait until Monday afternoon to make the request to allow for the possibility of Joe re-scheduling again, but I thought that I should make you aware of my conflict.

Charles

**From:** Heninger, Brian  
**Sent:** Friday, January 02, 2015 9:40 AM  
**To:** Matthew Ranson  
**Cc:** Lisa Tarquinio; Kopits, Elizabeth; Marten, Alex; Griffiths, Charles  
**Subject:** RE: Extreme weather report draft

Hi Matt,

Yes, we are still on for the 6<sup>th</sup>. We'll call you as usual.

Thanks for the "heads-up" on the draft.

Thanks, -Brian

**From:** Matthew Ranson [[mailto:Matthew\\_Ranson@abtassoc.com](mailto:Matthew_Ranson@abtassoc.com)]  
**Sent:** Wednesday, December 31, 2014 9:35 AM  
**To:** Heninger, Brian; Kopits, Elizabeth; Marten, Alex; Griffiths, Charles  
**Cc:** Lisa Tarquinio  
**Subject:** RE: Extreme weather report draft

Hi all,

Just wanted to let you know that Lisa and I have been working on the baseline losses sections, but due to the holidays, we probably won't have a draft for you by 1/6. Still, I think it would be useful to check in then, to get your comments on it.

Ex 5

Ex 5

Hope you all have a great New Year,

Matt

**Matthew Ranson, Ph.D | Associate | Abt Associates**

55 Wheeler Street | Cambridge, MA 02138

O: 617.520.2484 | F: 617.386.7568 | [www.abtassociates.com/environment](http://www.abtassociates.com/environment)

**From:** Matthew Ranson

**Sent:** Monday, December 22, 2014 4:30 PM

**To:** 'Heninger, Brian'; Lisa Tarquinio

**Cc:** Kopits, Elizabeth; Marten, Alex; Griffiths, Charles

**Subject:** RE: Extreme weather report draft

Hi Brian,

Nice to talk to you and Elizabeth, and thanks for the direction. We will start work on the baseline loss sections, and plan to check in again on 1/6.

Enjoy the holidays!

Matt

**Matthew Ranson, Ph.D | Associate | Abt Associates**

55 Wheeler Street | Cambridge, MA 02138

O: 617.520.2484 | F: 617.386.7568 | [www.abtassociates.com/environment](http://www.abtassociates.com/environment)

**From:** Heninger, Brian [<mailto:Heninger.Brian@epa.gov>]

**Sent:** Monday, December 22, 2014 4:02 PM

**To:** Matthew Ranson; Lisa Tarquinio

**Cc:** Kopits, Elizabeth; Marten, Alex; Griffiths, Charles

**Subject:** Extreme weather report draft

Hi Matt,

Thanks for your latest draft, and chatting with Elizabeth and I just now. It sounds like you are in a good place to make some progress over the next two weeks. As I mentioned, there is no rush, so just do as much as your holiday schedule allows. I am sending this with your latest draft still attached, and I am also cc'ing Charles Griffiths who will be taking a more of an active role in this.

## Ex 6 - Other

Happy Holidays! And we will talk again on 1/6.

Thanks, -Brian

**From:** Matthew Ranson [[mailto:Matthew\\_Ranson@abtassoc.com](mailto:Matthew_Ranson@abtassoc.com)]

**Sent:** Monday, December 22, 2014 3:20 PM

**To:** Heninger, Brian; Kopits, Elizabeth; Marten, Alex

**Cc:** Lisa Tarquinio

**Subject:** SCC: Extreme weather report draft

Hi all,

I'm attaching a full draft of all of the science sections of our report on extreme weather. Please read it over and let us know if you have any questions. This is all preliminary, so we would value your comments on any and all aspects of the deliverable.

Not sure if any of you are in the office tomorrow (Tuesday), but I'm happy to meet tomorrow at 10 if you want to check in about next steps on this.

Thanks,

Matt

**Matthew Ranson, Ph.D | Associate | Abt Associates**

55 Wheeler Street | Cambridge, MA 02138

O: 617.520.2484 | F: 617.386.7568 | [www.abtassociates.com/environment](http://www.abtassociates.com/environment)

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**From:** Miller, Chris J -FS

**Location:** Conference code

**Importance:** Normal

**Subject:** Social Cost of Carbon Uncertainty/Reliability

**Start Date/Time:** Wed 5/20/2015 5:30:00 PM

**End Date/Time:** Wed 5/20/2015 6:00:00 PM

[Newbold et al. 2013.pdf](#)

Apologies – but the original proposed time did not work for this call. Hope this new time works for folks (Wednesday 11:30-12:00 Mountain time).

## Ex 5

Conference code

Not necessary reading but for additional background see attached paper.

Participants:

EPA National Center for Environmental Economics

USFS – Region 2 (Denver CO) staff (economics, minerals, air)

USFS – Washington Office – National Forest Systems staff (economics)



**To:** Marten, Alex[Marten.Alex@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]  
**From:** Heninger, Brian  
**Sent:** Mon 5/4/2015 12:17:34 PM  
**Subject:** RE: SCC update

## Ex 5

I can not make a 10 Tuesday call this week due to the **Non-Responsive** during that same 2 hour block. But we can set something up with Matt soon is needed.

I will reply to Matt in the meantime, just so he knows we got this, and will get back to him.

Others opinions welcome.

-Brian

-----  
Brian Heninger

Economist / OP Quality Assurance Manager

U.S. Environmental Protection Agency

Office of the Administrator, Office of Policy (OP)

National Center for Environmental Economics

202-566-2270

**From:** Marten, Alex

**Sent:** Friday, May 01, 2015 9:40 PM  
**To:** Heninger, Brian; Griffiths, Charles  
**Subject:** Fw: SCC update

Brian and Charles

## Ex 5

--

Alex Marten  
[marten.alex@epa.gov](mailto:marten.alex@epa.gov)

---

**From:** Matthew Ranson <[Matthew\\_Ranson@abtassoc.com](mailto:Matthew_Ranson@abtassoc.com)>  
**Sent:** Friday, May 1, 2015 9:17:49 PM  
**To:** Heninger, Brian  
**Cc:** Griffiths, Charles; Marten, Alex; Lisa Tarquinio; Audrey Lew  
**Subject:** RE: SCC update

Hi Brian,

I'm pleased to send you a near-complete draft of the extreme weather report. I've added some notes for you in a couple of places, but except for that it's a clean copy. As I mentioned in my previous email, I think the report is at a point where it would be good for you and the NCEE SCC team to review carefully.

We'll plan to hold off on any further work until we hear back from you. Please let me know if you would like to set up a meeting in the next couple of weeks, either as a prelude to your review, or once you have comments.

Lisa and Audrey and I will look forward to your thoughts and suggestions about the document.

Thanks,

Matt

**Matthew Ranson, Ph.D | Associate | Abt Associates**

Environment and Natural Resources Division

55 Wheeler Street | Cambridge, MA 02138

O: 617.520.2484 | F: 617.386.7568 | [www.abtassociates.com/environment](http://www.abtassociates.com/environment)

**From:** Matthew Ranson

**Sent:** Wednesday, April 29, 2015 10:33 AM

**To:** Brian Heninger <[Heninger.Brian@epa.gov](mailto:Heninger.Brian@epa.gov)>

**Cc:** Griffiths, Charles ([Griffiths.Charles@epa.gov](mailto:Griffiths.Charles@epa.gov)); Alex Marten ([Marten.Alex@epa.gov](mailto:Marten.Alex@epa.gov))

**Subject:** SCC update

Hi Brian,

## Ex 5

since we've talked, so I just wanted to send you a quick status update as well.

I'm planning to send you a complete, clean draft of the SCC report by Monday morning. It has come a long way since the last version, in terms of coverage of analytical and empirical topics in the literature. It has also gotten quite long--I think it's about 90 pages right now. However, we've tried hard to smooth out the writing, and have moved a lot of material into appendices.

Overall, I think it's turned into a pretty good report. I think a useful next step would be for you and the SCC team to review the document carefully, and let us know what further comments and suggestions you have. Since we are getting towards the end of this work assignment--I'm

## Ex 5

Thanks,

Matt

**Matthew Ranson, Ph.D | Associate | Abt Associates**

Environment and Natural Resources Division

55 Wheeler Street | Cambridge, MA 02138

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**To:** Marten, Alex[Marten.Alex@epa.gov]; Barron, Alex[Barron.Alex@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]  
**Cc:** Linn, Joshua  
**From:** Laity, Jim  
**Sent:** Fri 5/22/2015 12:36:00 AM  
**Subject:** RE: Draft Final SCC Documents  
2015 05 22 SCC RtC.docx

EOP email/phone

Thx Alex. Good catches.

Josh, Please use this version which accepts Alex's edits. Jim

**From:** Marten, Alex [mailto:Marten.Alex@epa.gov]  
**Sent:** Thursday, May 21, 2015 8:09 PM  
**To:** Laity, Jim; Barron, Alex; Kopits, Elizabeth  
**Cc:** Linn, Joshua  
**Subject:** Re: Draft Final SCC Documents

I like the edits to both documents. In the attached I have suggested two edits to the last sentence in section 1 of the RTC to: 1.) use "revisions" consistent with elsewhere and 2.) to address a locational adjective whose noun was not clear from the placement. I also suggested deleting three extra spaces in the technical addendum portion.

Thanks.

--

Alex Marten

[marten.alex@epa.gov](mailto:marten.alex@epa.gov)

---

**From:** Laity, Jim <[laity.jim@epa.gov](mailto:laity.jim@epa.gov)>  
**Sent:** Thursday, May 21, 2015 7:15 PM  
**To:** Marten, Alex; Barron, Alex; Kopits, Elizabeth  
**Cc:** Linn, Joshua  
**Subject:** Draft Final SCC Documents

EOP email/phone

Alex2 and Elizabeth: Here are the documents we intend to distribute tomorrow.

Ex 5

**Ex 5**

Ex 5

I will be out tomorrow but Josh will be handling the call and IWG distribution. Jim

**From:** Kopits, Elizabeth

**Location:**

Conference code

**Importance:** Normal

**Subject:** FW: SCC - Call to discuss final comments on NAS charge

**Categories:** EZ Record - Shared

**Start Date/Time:** Thur 5/14/2015 6:00:00 PM

**End Date/Time:** Thur 5/14/2015 7:00:00 PM

-----Original Appointment-----

**From:** Kopits, Elizabeth

**Sent:** Thursday, May 07, 2015 2:12 PM

**To:** Kopits, Elizabeth; McGartland, Al; Marten, Alex; [James A. Laity](#) EOP email/phone

[Richard Duke](#) EOP email/phone; [Elke.Hodson@Hq.Doe.Gov](#); [Joshua A. Linn](#) EOP email/phone

**Cc:** Barron, Alex

**Subject:** SCC - Call to discuss final comments on NAS charge

**When:** Thursday, May 14, 2015 2:00 PM-3:00 PM (UTC-05:00) Eastern Time (US & Canada).

**Where:** Conference code

**To:** Barron, Alex[Barron.Alex@epa.gov]; Fawcett, Allen[Fawcett.Allen@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]  
**Cc:** Durham, Natalie[Durham.Natalie@epa.gov]  
**From:** McGartland, Al  
**Sent:** Mon 4/20/2015 1:41:30 PM  
**Subject:** RE: SCC Technical Discussion

## Conference code

**From:** Barron, Alex  
**Sent:** Monday, April 20, 2015 9:37 AM  
**To:** McGartland, Al  
**Subject:** Fwd: SCC Technical Discussion

Al - Janet is out today and I don't have my call in handy. Can you dig one up?

Sent from my iPhone

Begin forwarded message:

**From:** "Fawcett, Allen" <Fawcett.Allen@epa.gov>  
**Date:** April 20, 2015 at 9:20:58 AM EDT  
**To:** "Barron, Alex" <Barron.Alex@epa.gov>, "McGartland, Al" <McGartland.Al@epa.gov>, "Marten, Alex" <Marten.Alex@epa.gov>  
**Subject:** RE: SCC Technical Discussion

Alex, is there a call-in number for this yet?

---

**From:** Barron, Alex  
**Sent:** Friday, April 17, 2015 4:21 PM  
**To:** McGartland, Al; Marten, Alex; Fawcett, Allen  
**Subject:** FW: SCC Technical Discussion



-----Original Appointment-----

**From:** Barron, Alex

**Sent:** Friday, April 17, 2015 1:24 PM

**To:** Laity, Jim

**Subject:** Accepted: SCC Technical Discussion

**When:** Monday, April 20, 2015 2:30 PM-3:00 PM (UTC-05:00) Eastern Time (US & Canada).

**Where:** Call-in Number TBD

**To:** Marten, Alex[Marten.Alex@epa.gov]; Barron, Alex[Barron.Alex@epa.gov]; Duke, Rick[**EOP email/phone**]  
**Cc:** Lueken, Roger[Röger.Lueken@brattle.com]; McGartland, Al[McGartland.Al@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]  
**From:** Bishop, Heidi  
**Sent:** Mon 3/30/2015 7:50:41 PM  
**Subject:** RE: Social Cost of Carbon Data

Thank you so much!

**From:** Marten, Alex [mailto:Marten.Alex@epa.gov]  
**Sent:** Monday, March 30, 2015 3:07 PM  
**To:** Bishop, Heidi; Barron, Alex; Duke, Rick  
**Cc:** Lueken, Roger; McGartland, Al; Kopits, Elizabeth  
**Subject:** RE: Social Cost of Carbon Data

Hi Heidi,

I have attached the full set of SCC estimates from the simulations underlying the numbers in the 2013 SCC TSD.

Please let me know if you have any questions.

--

Alex L. Marten  
phone: (202) 566-2301  
email: [marten.alex@epa.gov](mailto:marten.alex@epa.gov)

**From:** Bishop, Heidi [mailto:Heidi.Bishop@brattle.com]  
**Sent:** Monday, March 30, 2015 2:30 PM  
**To:** Barron, Alex; Duke, Rick  
**Cc:** Lueken, Roger; Marten, Alex; McGartland, Al; Kopits, Elizabeth  
**Subject:** RE: Social Cost of Carbon Data

Thank you for offering to assist. We are looking for the full SCCs out through time from the three models and appreciate any help you can provide.

Many thanks,

Heidi

**HEIDI BISHOP**

Senior Policy and Marketing Analyst  
The Brattle Group

**Direct** +1.202.419.3337

**Mobile** +1.410.713.2566

**Main** +1.202.955.5050

[brattle.com](http://brattle.com)

**From:** Barron, Alex [<mailto:Barron.Alex@epa.gov>]

**Sent:** Friday, March 27, 2015 7:18 PM

**To:** Duke, Rick

**Cc:** Fox-Penner, Peter; Bishop, Heidi; Lueken, Roger; Marten, Alex; McGartland, Al; Kopits, Elizabeth

**Subject:** Re: Social Cost of Carbon Data

Adding folks from NCEE who can be in touch next week.

Sent from my iPhone

On Mar 27, 2015, at 7:13 PM, Duke, Rick

**EOP email/phone**

wrote:

Alex: can you help? thks

**From:** Fox-Penner, Peter [<mailto:Peter.Fox-Penner@brattle.com>]

**Sent:** Friday, March 27, 2015 4:45 PM

**To:** Duke, Rick

**Cc:** Bishop, Heidi; Lueken, Roger

**Subject:** Social Cost of Carbon Data

Hi Rick –

Hope all is well with you.

I know you might not be deeply involved in the SCC, but I wonder if you can introduce me to someone who could steer us to some backup data – namely the full set of SCCs out through time from the three models.

If you are working on this, and/or want to talk about it, would love to. We are working on the Minnesota PUC case that is applying SCC to utilities.

All the best and thanks

\*\*\*\*\*

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Please ensure you have adequate virus protection before you open or use attachments. The Brattle Group does not accept any liability for viruses.

\*\*\*\*\*

**From:** Barron, Alex  
**Location:** Call in: **Conference code**  
**Importance:** Normal  
**Subject:** Tentative: FW: SCC - Call to discuss final comments on NAS charge  
**Categories:** Record Saved - Shared  
**Start Date/Time:** Thur 5/14/2015 6:00:00 PM  
**End Date/Time:** Thur 5/14/2015 7:00:00 PM

**From:** Barron, Alex  
**Location:** Call in: **Conference code**  
**Importance:** Normal  
**Subject:** Accepted: SCC - Call to discuss final comments on NAS charge  
**Categories:** Record Saved - Shared  
**Start Date/Time:** Thur 5/14/2015 6:00:00 PM  
**End Date/Time:** Thur 5/14/2015 7:00:00 PM

**To:** Heninger, Brian[Heninger.Brian@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]  
**Cc:** Marten, Alex[Marten.Alex@epa.gov]  
**From:** Matthew Ranson  
**Sent:** Wed 3/18/2015 2:05:32 PM  
**Subject:** RE: Status update

Sure, that works for me.

**Matthew Ranson, Ph.D | Associate | Abt Associates**

Environment and Natural Resources Division

55 Wheeler Street | Cambridge, MA 02138

O: 617.520.2484 | F: 617.386.7568 | [www.abtassociates.com/environment](http://www.abtassociates.com/environment)

**From:** Heninger, Brian [mailto:Heninger.Brian@epa.gov]  
**Sent:** Wednesday, March 18, 2015 10:02 AM  
**To:** Griffiths, Charles; Matthew Ranson  
**Cc:** Marten, Alex  
**Subject:** RE: Status update

That's OK with me. Does that work for you Matt?

**From:** Griffiths, Charles  
**Sent:** Wednesday, March 18, 2015 8:32 AM  
**To:** Heninger, Brian; Matthew Ranson  
**Cc:** Marten, Alex  
**Subject:** RE: Status update

Can we possibly push it to April 14<sup>th</sup>. I will be taking annual leave the week of the 7<sup>th</sup> **Ex 6 - Other**  
**Ex 6 - Other**

Thanks,

Charles

**From:** Heninger, Brian  
**Sent:** Tuesday, March 17, 2015 8:09 AM  
**To:** Matthew Ranson  
**Cc:** Marten, Alex; Griffiths, Charles  
**Subject:** RE: Status update

OK, Thanks Matt. It's good to see where you are in the paper.

We'll talk on 4/7, 10:00.

-Brian

**From:** Matthew Ranson [[mailto:Matthew\\_Ranson@abtassoc.com](mailto:Matthew_Ranson@abtassoc.com)]  
**Sent:** Monday, March 16, 2015 10:21 PM  
**To:** Heninger, Brian  
**Cc:** Marten, Alex; Griffiths, Charles  
**Subject:** RE: Status update

Hi all,

Most recent draft is attached. As I mentioned,

**Ex 5**

**Ex 5**

Thanks,

Matt



**Matthew Ranson, Ph.D | Associate | Abt Associates**

Environment and Natural Resources Division

55 Wheeler Street | Cambridge, MA 02138

O: 617.520.2484 | F: 617.386.7568 | [www.abtassociates.com/environment](http://www.abtassociates.com/environment)

**From:** Matthew Ranson  
**Sent:** Monday, March 16, 2015 5:20 PM  
**To:** 'Heninger, Brian'  
**Cc:** Marten, Alex; Griffiths, Charles  
**Subject:** RE: Status update

Hi Brian,

Sure, let's plan to meet in three weeks (4/7). At that point we will have a lot to discuss. Just to keep you informed about where we are in the paper, I'll plan to send you a draft today and another one in two weeks.

Enjoy spring break,

Matt

**Matthew Ranson, Ph.D | Associate | Abt Associates**

Environment and Natural Resources Division

55 Wheeler Street | Cambridge, MA 02138

O: 617.520.2484 | F: 617.386.7568 | [www.abtassociates.com/environment](http://www.abtassociates.com/environment)

**From:** Heninger, Brian [<mailto:Heninger.Brian@epa.gov>]  
**Sent:** Monday, March 16, 2015 3:20 PM  
**To:** Matthew Ranson  
**Cc:** Marten, Alex; Griffiths, Charles  
**Subject:** RE: Status update

OK on skipping tomorrow.

However, two weeks from tomorrow, I will be on Spring Break. (Several schools around here have break that week.) So depending on your progress, we can talk in 8 days (3/24) or wait three weeks until 4/7. If you just moving along on filling in the sections, then three weeks should be fine.

Let me know what works best for the progress you are making. We don't have any pressing issues or questions (unless Charles or Alex disagrees.) So why don't you let us know which of above suggestions works best.

Thanks, -Brian

**From:** Matthew Ranson [[mailto:Matthew\\_Ranson@abtassoc.com](mailto:Matthew_Ranson@abtassoc.com)]  
**Sent:** Monday, March 16, 2015 3:03 PM  
**To:** Heninger, Brian  
**Cc:** Marten, Alex; Griffiths, Charles  
**Subject:** SCC: Status update

Hi Brian,

Just wanted to give you a status update on the extreme weather work. We have continued to work on the paper, particularly on the extratropical cyclones and flooding sections. I am reviewing today, and will send you a draft later in the day.

Unless there is something that you want to discuss, I think we could skip our meeting tomorrow. Maybe we can plan to meet two weeks from tomorrow?

Thanks,

Matt

**Matthew Ranson, Ph.D | Associate | Abt Associates**

Environment and Natural Resources Division

55 Wheeler Street | Cambridge, MA 02138

O: 617.520.2484 | F: 617.386.7568 | [www.abtassociates.com/environment](http://www.abtassociates.com/environment)

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**To:** Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]  
**Cc:** Griffiths, Charles[Griffiths.Charles@epa.gov]  
**From:** Heninger, Brian  
**Sent:** Tue 1/6/2015 3:03:24 PM  
**Subject:** 10:30 we'll call you

Hi Elizabeth,

I don't recall where we left this with you, but FYI - we will call your cell at 10:30.

-Brian

PS - Did you hear the SCC piece on NPR last night?

-----Original Message-----

From: Kopits, Elizabeth  
Sent: Tuesday, January 06, 2015 9:03 AM  
To: Griffiths, Charles  
Cc: Marten, Alex; Newbold, Steve; Wolverton, Ann; Heninger, Brian  
Subject: Re: Teleworking

Whatever is easiest. My cell is Personal cell/email Thanks!

> On Jan 6, 2015, at 9:01 AM, "Griffiths, Charles" <Griffiths.Charles@epa.gov> wrote:

>

> Ok, but I think the plan was for Brian to initiate the call with Abt. Did you want us to call you at 10:30 or do you want me to set up a call-in number.

>

> Charles

>

>

>

> -----Original Message-----

> From: Kopits, Elizabeth

> Sent: Tuesday, January 06, 2015 8:56 AM

> To: McGartland, Al; Levitt, Shelley; Simon, Nathalie; Bowen, Jennifer; Marten, Alex; Newbold, Steve; Griffiths, Charles; Wolverton, Ann; Klemick, Heather; Heninger, Brian; Morgan, Cynthia

> Subject: Teleworking

>

> Change of plans. I will be teleworking all morning, but will likely still try to make it in for the 1pm scc meeting with Joel in person.

> Brian and Charles - I will call in to the 10:30am meeting with Abt.

>

> Thanks,  
> Elizabeth

>

>

>

>> On Jan 6, 2015, at 5:51 AM, "Kopits, Elizabeth" <Kopits.Elizabeth@epa.gov> wrote:

>>

>>

>>

>>

**To:** Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]  
**Cc:** Griffiths, Charles[Griffiths.Charles@epa.gov]  
**From:** Heninger, Brian  
**Sent:** Tue 1/6/2015 3:03:24 PM  
**Subject:** 10:30 we'll call you

Hi Elizabeth,

I don't recall where we left this with you, but FYI - we will call your cell at 10:30.

-Brian

PS - Did you hear the SCC piece on NPR last night?

-----Original Message-----

From: Kopits, Elizabeth  
Sent: Tuesday, January 06, 2015 9:03 AM  
To: Griffiths, Charles  
Cc: Marten, Alex; Newbold, Steve; Wolverton, Ann; Heninger, Brian  
Subject: Re: Teleworking

Whatever is easiest. My cell is Personal cell/email. Thanks!

> On Jan 6, 2015, at 9:01 AM, "Griffiths, Charles" <Griffiths.Charles@epa.gov> wrote:

>

> Ok, but I think the plan was for Brian to initiate the call with Abt. Did you want us to call you at 10:30 or do you want me to set up a call-in number.

>

> Charles

>

>

>

> -----Original Message-----

> From: Kopits, Elizabeth

> Sent: Tuesday, January 06, 2015 8:56 AM

> To: McGartland, Al; Levitt, Shelley; Simon, Nathalie; Bowen, Jennifer; Marten, Alex; Newbold, Steve; Griffiths, Charles; Wolverton, Ann; Klemick, Heather; Heninger, Brian; Morgan, Cynthia

> Subject: Teleworking

>

> Change of plans. I will be teleworking all morning, but will likely still try to make it in for the 1pm scc meeting with Joel in person.

> Brian and Charles - I will call in to the 10:30am meeting with Abt.

>

> Thanks,

> Elizabeth

>

>

>

>> On Jan 6, 2015, at 5:51 AM, "Kopits, Elizabeth" <Kopits.Elizabeth@epa.gov> wrote:

>>

>>

>>

>>

**From:** Durham, Natalie

**Location:** TBD - 1 Conference code

**Importance:** Normal

**Subject:** Tentative HOLD SCC Kevin Rennert Meeting

**Start Date/Time:** Mon 7/27/2015 7:30:00 PM

**End Date/Time:** Mon 7/27/2015 8:30:00 PM

**From:** Durham, Natalie

**Location:** TBD -

**Importance:** High

**Subject:** Canceled: Tentative HOLD SCC Kevin Rennert Meeting

**Start Date/Time:** Mon 7/27/2015 7:30:00 PM

**End Date/Time:** Mon 7/27/2015 8:30:00 PM

**Conference code**

**From:** Beauvais, Joel

**Location:** DCRoomARN3500/OPEI

**Importance:** Normal

**Subject:** Copy: SCC Draft Charge - Call in:

**Conference code**

**Categories:** Climate Change, Water Related Issues

**Start Date/Time:** Tue 1/6/2015 6:00:00 PM

**End Date/Time:** Tue 1/6/2015 6:30:00 PM



**From:** Heninger, Brian  
**Location:** NCEE will call Abt/Matt at his office from Charles Office  
**Importance:** Normal  
**Subject:** Copy: Social Cost of Carbon - (Periodic Check-in)  
**Categories:** Climate Change  
**Start Date/Time:** Tue 4/14/2015 5:00:00 PM  
**End Date/Time:** Tue 4/14/2015 5:30:00 PM

Rescheduled Time

**Social Cost of Carbon** - Work Assignment #4-87 (Periodic Check-in) - non-reoccurring - will set up separate meetings as needed.

NCEE location: Charles office, unless I designate a room or call in number as needed based on participation.

NCEE will call Matt at his office: Personal cell/email

-----  
Brian Heninger  
Economist / OP Quality Assurance Manager  
U.S. Environmental Protection Agency  
Office of the Administrator, Office of Policy (OP)  
National Center for Environmental Economics  
202-566-2270

**To:** Wolverton, Ann[Wolverton.Ann@epa.gov]; Simon, Nathalie[Simon.Nathalie@epa.gov]; Bowen, Jennifer[Bowen.Jennifer@epa.gov]; Dockins, Chris[Dockins.Chris@epa.gov]; Evans, DavidA[Evans.DavidA@epa.gov]; Ferris, Ann[Ferris.Ann@epa.gov]; Garbaccio, Richard[Garbaccio.Richard@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]; Klemick, Heather[Klemick.Heather@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]; McGartland, Al[McGartland.Al@epa.gov]; Moore, Chris[Moore.Chris@epa.gov]; Newbold, Steve[Newbold.Steve@epa.gov]; Pasurka, Carl[Pasurka.Carl@epa.gov]; Sargent, Keith[Sargent.Keith@epa.gov]; Shadbegian, Ron[Shadbegian.Ron@epa.gov]; Sheriff, Glenn[Sheriff.Glenn@epa.gov]; Simpson, David[Simpson.David@epa.gov]; Snyder, Brett[Snyder.Brett@epa.gov]; Nagelhout, Peter[Naghelout.Peter@epa.gov]

Call-in number: **Conference code**

Conference extension: **Conference code**

Participant code: **Conference code**

**From:** Kime, Robin

**Location:** DCRoomARN3500/OPEI

**Importance:** Normal

**Subject:** SCC Draft Charge - Call in:  **Conference code**

**Start Date/Time:** Tue 1/6/2015 6:00:00 PM

**End Date/Time:** Tue 1/6/2015 6:30:00 PM

**From:** McGartland, Al  
**Location:** Call in: Conference code  
**Importance:** Normal  
**Subject:** Accepted: SCC - Call to discuss final comments on NAS charge  
**Start Date/Time:** Thur 5/14/2015 6:00:00 PM  
**End Date/Time:** Thur 5/14/2015 7:00:00 PM

**From:** Microsoft Outlook  
**Location:** Call in: **Conference code**  
**Importance:** Normal  
**Subject:** Meeting Forward Notification: SCC - Call to discuss final comments on NAS charge  
**Start Date/Time:** Thur 5/14/2015 6:00:00 PM  
**End Date/Time:** Thur 5/14/2015 7:00:00 PM

### **Your meeting was forwarded**

Marten, Alex has forwarded your meeting request to additional recipients.

#### **Meeting**

SCC - Call to discuss final comments on NAS charge

#### **Meeting Time**

Thursday, May 14, 2015 2:00 PM-3:00 PM.

#### **Recipients**

Barron, Alex

alex.marten.work@gmail.com

All times listed are in the following time zone: (UTC-05:00) Eastern Time (US & Canada)

---

Sent by Microsoft Exchange Server 2016

**From:** Torrusio, Michele

**Location:** { **Conference code**

**Importance:** Normal

**Subject:** Accepted: check-in call on SCC

**Start Date/Time:** Mon 5/11/2015 5:45:00 PM

**End Date/Time:** Mon 5/11/2015 6:00:00 PM

5

**From:** Torrusio, Michele

**Location:** Conference code

**Importance:** Normal

**Subject:** Accepted: FW: check-in call on SCC

**Start Date/Time:** Mon 5/11/2015 5:30:00 PM

**End Date/Time:** Mon 5/11/2015 6:00:00 PM

5

**From:** Torrusio, Michele

**Location:**

<b>Conference code</b>
------------------------

**Importance:** Normal

**Subject:** Accepted: FW: SCC - Call to discuss final comments on NAS charge

**Start Date/Time:** Thur 5/14/2015 6:00:00 PM

**End Date/Time:** Thur 5/14/2015 7:00:00 PM



**From:** Stocking, Andrew

**Location:** Call in:

**Importance:** Normal

**Subject:** Accepted: FW: SCC - Call to discuss final comments on NAS charge

**Start Date/Time:** Thur 5/14/2015 6:00:00 PM

**End Date/Time:** Thur 5/14/2015 7:00:00 PM

**From:** Alston, Lisa (CONTR)

**Location:** Conference code

**Importance:** Normal

**Subject:** Accepted: FW: SCC - Call to discuss final comments on NAS charge

**Start Date/Time:** Thur 5/14/2015 6:00:00 PM

**End Date/Time:** Thur 5/14/2015 7:00:00 PM

**From:** Down, Adrian (FELLOW)

**Location:**

<b>Conference code</b>
------------------------

**Importance:** Normal

**Subject:** Tentative: FW: SCC - Call to discuss final comments on NAS charge

**Start Date/Time:** Thur 5/14/2015 6:00:00 PM

**End Date/Time:** Thur 5/14/2015 7:00:00 PM

**From:** Gillingham, Ken

**Location:** Conference code

**Importance:** Normal

**Subject:** NAS SCC kick-off agenda

**Start Date/Time:** Wed 7/22/2015 6:30:00 PM

**End Date/Time:** Wed 7/22/2015 7:00:00 PM

**From:** McGartland, Al

**Location:** Conference code

**Importance:** Normal

**Subject:** SCC Team Check Meeting - Elizabeth K.

**Start Date/Time:** Thur 7/23/2015 6:00:00 PM

**End Date/Time:** Thur 7/23/2015 6:45:00 PM

From: Linn, Joshua

Location:  **Conference code**

Importance: Normal

Subject: SCC

Start Date/Time: Thur 6/25/2015 2:30:00 PM

End Date/Time: Thur 6/25/2015 3:30:00 PM

**Conference code**

**From:** Wolverton, Ann  
**Location:** DCRoomWest4118/OPEI  
**Importance:** Normal  
**Subject:** SCC discussion  
**Start Date/Time:** Mon 5/11/2015 4:30:00 PM  
**End Date/Time:** Mon 5/11/2015 5:00:00 PM

Call-in 1-855-564-1700

Conference extension: 1104390 (no #)

Participant code: 234567 (no #)

**From:** Wolverton, Ann  
**Location:** DCRoomWest4118/OPEI  
**Importance:** Normal  
**Subject:** SCC discussion  
**Start Date/Time:** Mon 5/11/2015 4:30:00 PM  
**End Date/Time:** Mon 5/11/2015 5:00:00 PM

Call-in 1

Confer 6

Particip

**Conference code**



**From:** Kopits, Elizabeth  
**Location:** Call in: 866-299-3188, code: 3274437140  
**Importance:** Normal  
**Subject:** SCC - Call to discuss final comments on NAS charge  
**Start Date/Time:** Thur 5/14/2015 6:00:00 PM  
**End Date/Time:** Thur 5/14/2015 7:00:00 PM

**From:** Kopits, Elizabeth

**Location:**

**Conference code**

**Importance:** Normal

**Subject:** SCC - Call to discuss final comments on NAS charge

**Start Date/Time:** Thur 5/14/2015 6:00:00 PM

**End Date/Time:** Thur 5/14/2015 7:00:00 PM

**From:** Kopits, Elizabeth

**Location:**

**Conference code**

**Importance:** Normal

**Subject:** check-in call on SCC

**Start Date/Time:** Mon 5/11/2015 5:45:00 PM

**End Date/Time:** Mon 5/11/2015 6:00:00 PM

**From:** Beauvais, Joel

**Location:** DCRoomARN3500/OPEI

**Importance:** Normal

**Subject:** SCC Draft Charge -

**Conference code**

**Start Date/Time:** Tue 1/6/2015 6:00:00 PM

**End Date/Time:** Tue 1/6/2015 6:30:00 PM

**From:** Beauvais, Joel  
**Location:** DCRoomARN3500/OPEI  
**Importance:** Normal  
**Subject:** SCC Draft Charge  
**Start Date/Time:** Tue 1/6/2015 6:00:00 PM  
**End Date/Time:** Tue 1/6/2015 6:30:00 PM

**Conference code**

**To:** Marten, Alex[Marten.Alex@epa.gov]  
**Cc:** Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]  
**From:** Shouse, Kate  
**Sent:** Mon 7/6/2015 2:01:49 AM  
**Subject:** Re: FYI SCC blog post is live

Thx! **Non-Responsive**

Sent from my iPhone

On Jul 2, 2015, at 5:18 PM, Marten, Alex <Marten.Alex@epa.gov> wrote:

<https://www.whitehouse.gov/blog/2015/07/02/estimating-benefits-carbon-dioxide-emissions-reductions>

--

Alex L. Marten  
phone: (202) 566-2301  
email: marten.alex@epa.gov

**From:** Marten, Alex  
**Location:** DCRoomWest4118/OPEI  
**Importance:** Normal  
**Subject:** FW: SCC discussion  
**Start Date/Time:** Mon 5/11/2015 4:30:00 PM  
**End Date/Time:** Mon 5/11/2015 5:00:00 PM

No obligation, but so you are at least aware

-----Original Appointment-----

**From:** Wolverton, Ann  
**Sent:** Friday, May 08, 2015 12:52 PM  
**To:** Wolverton, Ann; Kopits, Elizabeth; Marten, Alex; Matthew Ranson; David Chapman  
([DChapman@stratusconsulting.com](mailto:DChapman@stratusconsulting.com))  
**Subject:** SCC discussion  
**When:** Monday, May 11, 2015 12:30 PM-1:00 PM (UTC-05:00) Eastern Time (US & Canada).  
**Where:** DCRoomWest4118/OPEI

Call-in:

Conference extension:

Participant code:

**To:** Barron, Alex[Barron.Alex@epa.gov]  
**From:** Kopits, Elizabeth  
**Sent:** Fri 3/27/2015 11:18:17 PM  
**Subject:** Automatic reply: Social Cost of Carbon Data

## Non-Responsive

Please contact Jennifer Bowen (bowen.jennifer@epa.gov, 202-566-2281) for assistance.

If you have a social cost of carbon related inquiry, please contact Alex Marten (marten.alex@epa.gov).



**To:** Barron, Alex[Barron.Alex@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]  
**From:** Evans, DavidA  
**Sent:** Wed 2/25/2015 8:27:00 PM  
**Subject:** RE: AEA papers  
[burtraw et al are 2014.pdf](#)  
[bayliss et al 2013 aer.pdf](#)

Alex,

I'm pretty positive nothing in the AER 2014 piece by Burtraw et al. is not in the discussion paper, but I can check with them if you would like.

**Non-Responsive**

**Non-Responsive**

I should probably also check if I have supplementary info from their analysis somewhere.

Don and his coauthors have a pile of papers on leakage issues. It is all in a theoretical GE economy-wide framework. Their most recent one, which is actually an attempt to parameterize a simple CGE model to see if it replicates the findings of a more complex one given certain behavior and preference-driven relationships b/w key economic variables, was presented at ASSAs in Boston this year.

**Non-Responsive**

**Non-Responsive**

**Non-Responsive**

Will send the other two papers shortly.

d

**From:** Barron, Alex  
**Sent:** Wednesday, February 25, 2015 3:04 PM  
**To:** Marten, Alex; Evans, DavidA  
**Subject:** AEA papers

Not really your jobs, but I figure you may have a better sense of how to get access to these. The first one is the pressing question.

First does this paper have anything not in the discussion draft? Are the results the same?

Burtraw, Dallas, Josh Linn, Karen Palmer, and Anthony Paul. 2014. "The Costs and Consequences of Clean Air Act Regulation of CO2 from Power Plants." *American Economic Review*, 104(5): 557-62.

I am interested in a copy of this:

Sunstein, Cass R. 2014. "On Not Revisiting Official Discount Rates: Institutional Inertia and the Social Cost of Carbon." *American Economic Review*, 104(5): 547-51.

And this:

Weitzman, Martin L. 2014. "Fat Tails and the Social Cost of Carbon." *American Economic Review*, 104(5): 544-46.

And, if easy:

Leakage, Welfare, and Cost-Effectiveness of Carbon Policy (pp. 332-37) 103(3):

*Kathy Baylis, Don Fullerton and Daniel H. Karney*

Alex Barron, Ph.D.

Deputy Associate Administrator

Office of Policy

U.S. Environmental Protection Agency

202-564-3304

**To:** Barron, Alex[Barron.Alex@epa.gov]  
**From:** Kopits, Elizabeth  
**Sent:** Wed 2/11/2015 4:13:54 PM  
**Subject:** Automatic reply: Transcanada

# Non-Responsive

Please contact Jennifer Bowen (bowen.jennifer@epa.gov, 202-566-2281) for assistance.

If you have a social cost of carbon related inquiry, please contact Alex Marten (marten.alex@epa.gov).

**To:** Beauvais, Joel[Beauvais.Joel@epa.gov]  
**Cc:** McGartland, Al[McGartland.Al@epa.gov]; Wolverton, Ann[Wolverton.Ann@epa.gov]; Dockins, Chris[Dockins.Chris@epa.gov]; Axelrad, Daniel[Axelrad.Daniel@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; Morgan, Cynthia[Morgan.Cynthia@epa.gov]; Jenkins, Robin[Jenkins.Robin@epa.gov]; Simpson, David[Simpson.David@epa.gov]; Snyder, Brett[Snyder.Brett@epa.gov]; Maguire, Kelly[Maguire.Kelly@epa.gov]; Barron, Alex[Barron.Alex@epa.gov]; Kenny, Shannon[Kenny.Shannon@epa.gov]; Roberts, Martha[Roberts.Martha@epa.gov]; Kime, Robin[Kime.Robin@epa.gov]; Durham, Natalie[Durham.Natalie@epa.gov]; Bowen, Jennifer[Bowen.Jennifer@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]  
**From:** Simon, Nathalie  
**Sent:** Tue 1/13/2015 5:52:22 PM  
**Subject:** Proposed Agenda for Today's NCEE Update

Hi Joel--

Here is our proposed agenda for this afternoon's meeting. Please let us know if you have any other items you wish to discuss.

Thanks!  
Nathalie

Proposed Agenda  
NCEE Update Meeting  
Tuesday January 13, 2015  
WJCN 3500 3:15-4:15

1. Social Cost of Carbon

2.  
3.  
4.  
5.  
6.  
7.  
8.  
9.

**Non-Responsive**

**To:** Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]  
**From:** Barron, Alex  
**Sent:** Fri 1/23/2015 6:20:48 PM  
**Subject:** Thanks

Elizabeth – I don't know exactly when you are officially starting leave, but I just wanted to write to say thank you for your fantastic work (both in the run up to leave, and more generally).

You've been doing great work keeping the SCC and other projects on track and turning around high quality products quickly.

**Non-Responsive**

**Non-Responsive**

**Non-Responsive**

k. We will miss you while you are away attending to more important things.

Thanks and best wishes,

Alex

Alex Barron, Ph.D.

Deputy Associate Administrator

Office of Policy

U.S. Environmental Protection Agency

202-564-3304

**To:** Marten, Alex[Marten.Alex@epa.gov]  
**Cc:** Griffiths, Charles[Griffiths.Charles@epa.gov]  
**From:** Heninger, Brian  
**Sent:** Tue 3/10/2015 1:20:06 PM  
**Subject:** RE: Extreme Weather and SCC

# Non-Responsive

**From:** Marten, Alex  
**Sent:** Tuesday, March 10, 2015 9:15 AM  
**To:** Heninger, Brian  
**Cc:** Griffiths, Charles  
**Subject:** RE: Extreme Weather and SCC

# Non-Responsive

--

Alex L. Marten  
phone: (202) 566-2301  
email: [marten.alex@epa.gov](mailto:marten.alex@epa.gov)

**From:** Heninger, Brian  
**Sent:** Tuesday, March 10, 2015 9:00 AM  
**To:** [Matthew\\_Ranson@abtassoc.com](mailto:Matthew_Ranson@abtassoc.com)  
**Cc:** Griffiths, Charles; Marten, Alex  
**Subject:** Extreme Weather and SCC

Hi Matt,

Not sure if you see these things (e.g. ClimateWire) but this was in today's edition.

Extreme Weather piece is interesting, given your current work, and also here's yet another piece on SCC.

The second article on SCC links to EPA's SCC page :  
<http://www.epa.gov/climatechange/EPAactivities/economics/scc.html>

-Brian

<http://www.eenews.net/climatewire/2015/03/10/stories/1060014746>

## **Cabinet secretaries warn city leaders about costs of extreme weather**

Scott Detrow, E&E reporter

Published: Tuesday, March 10, 2015

Speaking to the National League of Cities' Congressional City Conference yesterday, Interior Secretary Sally Jewell quipped that the Obama administration should have held a Cabinet meeting at the Washington, D.C., conference. Jewell was the fourth Cabinet member to address the gathering of local leaders that afternoon. Earlier in the day, President Obama spoke to the group, too.

Energy Secretary Ernest Moniz, U.S. EPA Administrator Gina McCarthy and Transportation Undersecretary Peter Rogoff -- substituting for Anthony Foxx, who is recuperating from knee surgery -- focused their panel discussion on the effects that climate change will have on local infrastructure.

"A lot of people don't know this, but many of the transit tunnels and highway tunnels that flooded under Hurricane Sandy had just flooded a year earlier in Hurricane Irene," Rogoff said, arguing for the need for projects to anticipate extreme weather events.



"Far less newsworthy. But it makes the point that if we're going to have increasing frequency of major climatic conditions -- when the president provided that money for Hurricane Sandy, he made the point that the taxpayers should not have to pay to clean up these critical facilities time and time again -- we need to build them smarter. We need to build them in a fashion that they can withstand the future," he explained.

Moniz hinted that the Department of Energy's upcoming Quadrennial Energy Review -- due in "a few weeks" -- will delve into similar issues. "Risks from storm surges, for example. Our modeling there showing Category 1 storms could inundate about a thousand vital electric substations, for example, over these next decades. Heat waves degrading our infrastructure, but also increasing things like peak cooling requirements."

Fitting for a gathering of local officials, much of the discussion revolved around federal grants and partnership programs. Moniz announced that the Department of Energy had awarded \$6 million for 11 local efforts aimed at expanding the footprint of electric plug-in vehicles and other alternative fuels.

## **Cities can help states get clean energy funds**

McCarthy acknowledged that EPA "does not have the zeros on the end of its budget that these guys [the Energy and Transportation departments] do" when it comes to grants but did point out more than 40 percent of the agency's annual budget goes directly to states, municipal governments and tribes.

She argued that the Clean Power Plan, which aims to reduce the power sector's greenhouse gas emissions to 30 percent below 2005 levels over the next 15 years, could provide cities an opportunity for smart infrastructure growth.

"We are opening up opportunities for states to think more creatively and flexible about how to work with you to bring advantage, economically, and job growth in the choices they make in how to reduce their carbon pollution," McCarthy said. "They can do it if they want to, so get active in those discussions with your states."

The proposed rule requires states to lower their carbon footprints by transitioning away from coal-fired power plants and toward low- and zero-carbon fuel sources like natural gas, wind and solar. The Obama administration has touted the plan's third and fourth building blocks, which expand renewable energy and energy efficiency programs, as economic boons.

McCarthy touted a proposed \$4 billion program in Obama's budget that would help fund programs in states that attempt to go beyond their assigned Clean Power Plan goals. But the Republicans who control both the House and Senate have made it clear that they are not inclined to approve that funding (*ClimateWire*, Feb. 3).

<http://www.eenews.net/climatewire/2015/03/10/stories/1060014747>

## **Fossil fuel prices don't reflect true cost of carbon, report says**

Manon Verchot, E&E reporter

Published: Tuesday, March 10, 2015

Prices at the pump don't reflect the true cost of fossil fuels, according to a new study. When you add together the environmental, health and social costs of continuing business as usual with fossil fuel extraction and use, all of society gets billed, not just the consumer, it finds.

The bill may not show up when the tank is full, but it manifests itself in health care costs and environmental damages. For every gallon of gasoline, society gets a \$3.80 extra charge, while for every gallon of diesel, the cost is an additional \$4.80, the study says. Natural gas costs twice as much, and coal-fired electricity costs four times as much.

"Solar and wind are not so expensive when you consider the hidden costs of fossil fuels," said Drew Shindell, a professor of climate sciences at Duke University, who conducted the study. His work is the first to link the cost of air pollution and the release of carbon into the atmosphere in the same study.

"The people working on climate are not always the same people working on air quality -- they're different skill sets; they use different models," said Jason Hill, an associate professor at the University of Minnesota, who did not contribute to the research. "It's really good to see people looking at air quality impacts alongside climate change."

### **Some costs not included**

Shindell evaluated the effects of atmospheric release of air pollutants, like methane and aerosols, and the effects of carbon release on human health and the environment. He found that what car owners may not pay in fueling their car, they may pay in hospital bills when their child has an asthma attack. And if the car owner isn't paying, someone else in society is.

These costs also extend to other health risks, including premature death and costs of missed work and school days. On an environmental scale, society is paying for all the lower or failed crop yields and the extreme weather events linked to climate change, according to the study. As long as markets don't place a price on emissions, polluters will not pay for these costs, Shindell said.

"We care about the social cost of carbon or the social cost of atmospheric release because we want to make good choices and we want to make informed choices," Hill said.

Understanding the social cost of carbon and atmospheric pollutants can help countries develop policies and market barriers to address the risks. U.S. EPA uses these calculations to assess whether rulemakings have climate benefits. But there are limitations that make calculating these costs difficult.

These types of studies don't establish who is most affected by problems. They also can't account for all the factors that will influence societal cost, including issues like ocean acidification and biodiversity. For example, climate change has been linked to mental health issues, while air pollution can be linked to reduced IQ, but neither one of these factors has been sufficiently studied to accurately calculate their costs, which means that any social cost of carbon is a conservative estimate, according to Shindell.

Still, knowing that the cost of carbon and air pollution is high, even without including additional factors, can be informative. "I think it helps people make better choices," Shindell said.

**To:** Wolverton, Ann[Wolverton.Ann@epa.gov]; Dockins, Chris[Dockins.Chris@epa.gov]; McGartland, Al[McGartland.Al@epa.gov]; Shadbegian, Ron[Shadbegian.Ron@epa.gov]; Sargent, Keith[Sargent.Keith@epa.gov]; Newbold, Steve[Newbold.Steve@epa.gov]; Bowen, Jennifer[Bowen.Jennifer@epa.gov]; Pasurka, Carl[Pasurka.Carl@epa.gov]; Sheriff, Glenn[Sheriff.Glenn@epa.gov]; Simpson, David[Simpson.David@epa.gov]; Moore, Chris[Moore.Chris@epa.gov]; Simon, Nathalie[Simon.Nathalie@epa.gov]; Nagelhout, Peter[Nagelhout.Peter@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]; Ferris, Ann[Ferris.Ann@epa.gov]; Snyder, Brett[Snyder.Brett@epa.gov]; Garbaccio, Richard[Garbaccio.Richard@epa.gov]; Evans, DavidA[Evans.DavidA@epa.gov]; Klemick, Heather[Klemick.Heather@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]  
**Cc:** Dickie, Mark[Dickie.Mark@epa.gov]  
**From:** Wolverton, Ann  
**Sent:** Wed 6/17/2015 2:22:25 PM  
**Subject:** climate and international team meeting

I have shortened the time for our meeting to a ½ hour given a shorter agenda. Here are the items I have so far.

## Non-Responsive

- SCC NAS Process
- SCC RTC

Let me know if there is anything else.

Ann

**To:** Wolverton, Ann[Wolverton.Ann@epa.gov]; Dockins, Chris[Dockins.Chris@epa.gov]; McGartland, Al[McGartland.Al@epa.gov]; Shadbegian, Ron[Shadbegian.Ron@epa.gov]; Sargent, Keith[Sargent.Keith@epa.gov]; Newbold, Steve[Newbold.Steve@epa.gov]; Bowen, Jennifer[Bowen.Jennifer@epa.gov]; Pasurka, Carl[Pasurka.Carl@epa.gov]; Sheriff, Glenn[Sheriff.Glenn@epa.gov]; Simpson, David[Simpson.David@epa.gov]; Moore, Chris[Moore.Chris@epa.gov]; Simon, Nathalie[Simon.Nathalie@epa.gov]; Nagelhout, Peter[Nagelhout.Peter@epa.gov]; Kopits, Elizabeth[Kopits.Elizabeth@epa.gov]; Marten, Alex[Marten.Alex@epa.gov]; Ferris, Ann[Ferris.Ann@epa.gov]; Snyder, Brett[Snyder.Brett@epa.gov]; Garbaccio, Richard[Garbaccio.Richard@epa.gov]; Evans, DavidA[Evans.DavidA@epa.gov]; Klemick, Heather[Klemick.Heather@epa.gov]; Griffiths, Charles[Griffiths.Charles@epa.gov]  
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Ann